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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

SEE PAGE 377

Big Demand for Auto & Electrical EXPERTS

Electrical Expert

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Automotive and electrical fields growing by leaps and bounds. A hundred thousand more expert mechanics needed now. I can fit you in fifty days to fill a big job. McSweeny trained men earn from $50 to $250 per week. Read on for proof of this—

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DEAR MAC:

Before going to your school I was working on a farm for fifty dollars a month and did not have steady work nor a bright future. Now, as a result of your training, I have my own garage and sales agency and average $800 per month. I owe it all to your training.

(signed) GEORGE SMITH,
West Alexandria, Ohio.

And Fred Pendley, Blowing Rock, N. C., writes: "McSweeny training made me Chief Mechanic of a big plant in three months." These two are typical of many we could quote to prove that McSweeny training paves the way to better jobs and bigger pay.

NOW
Two Big Schools to train You for a Big Job!

I now control the former Rahe School of Cincinnati, Ohio, and the former Cleveland Auto School of Cleveland, Ohio. Chances are you can reach one of them by a day's trip. Two fine schools advantageously located—nearest the masses of population, the most autos and most jobs.

Guarantee

To whom it may concern:

I, J. B. Dudley, will state under oath that I am now attending the McSweeny School and find everything as represented. In fact, better than expected. The course of instruction is practical and the McSweeny method of learning by actually working with real tools on real jobs under experienced instructors enables a fellow to learn a powerful lot in a few days.

(signed) J. B. DUDLEY,
McSweeny School Student.

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2 INSTRUCTION STAFF: No other institution approaches LaSalle in the size and standing of its Accountancy Instruction Staff, which is composed of over seventy-five instructors—thirty-one Certified Public Accountants, including men of the highest standing in the profession. The staff is headed by Wm. B. Castenholz, C.P.A., M.A.I.A., author of Cost Accounting Procedure, and Auditing Procedure.

3 EXPERIENCE: Having for many years held first rank in the Accountancy field, LaSalle has trained far more Accountants and has made many more C.P.A's than any other institution. Its graduates are holding high salaried positions with business firms in every American and Canadian city.

4 PRACTICAL METHOD: LaSalle training can be had without interruption to a man's present work. The *LaSalle Problem Method* of home-study hurls the student right against the actual problems of the factory, office, store, bank, etc., and he solves these problems by actually doing them under the direction of experts. The big propositions of business are open to the men who can solve the problems of business.

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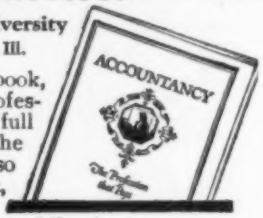

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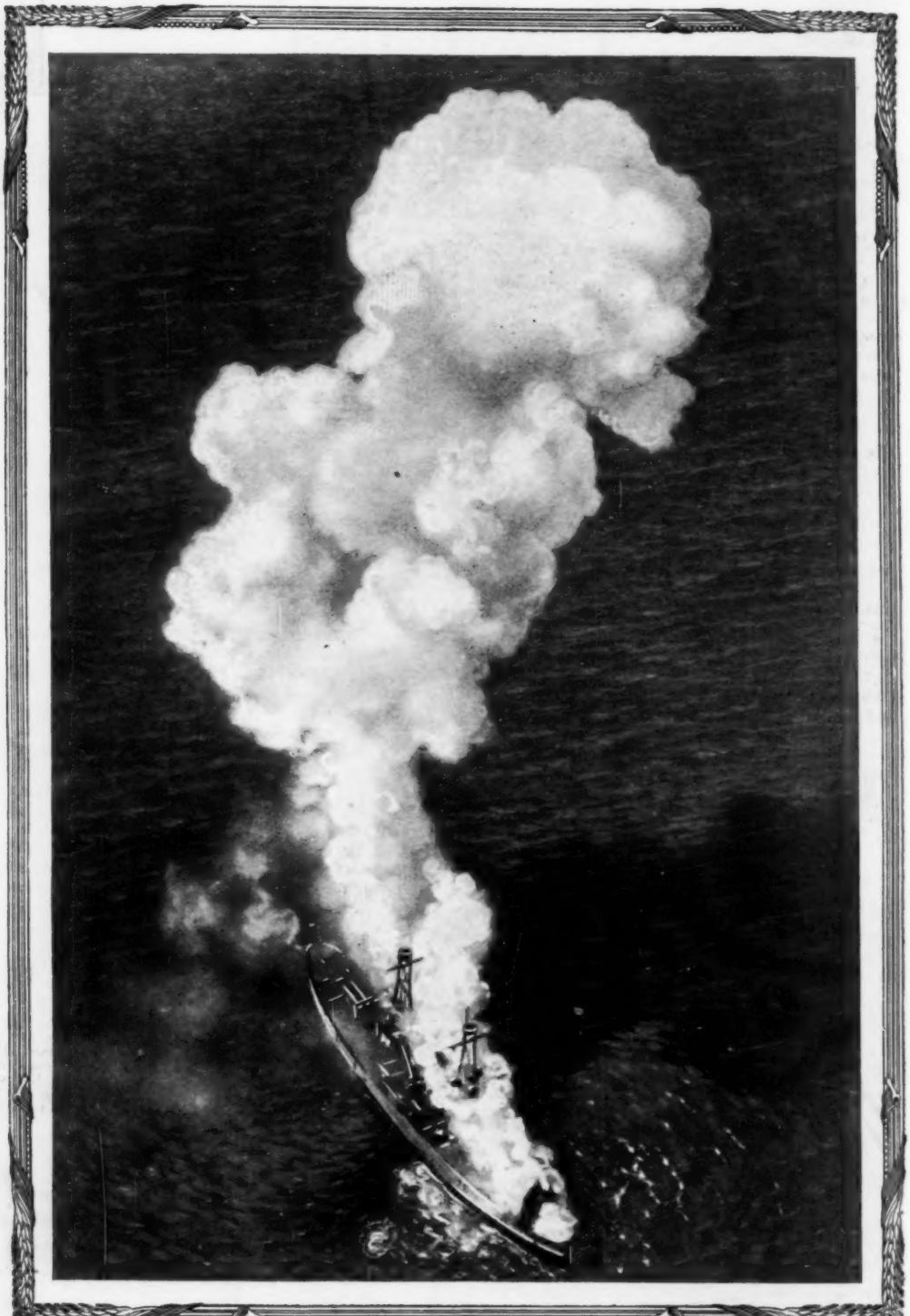

Dropping Destruction from the Skies; a Direct Hit on the Scrapped Battleship "Alabama" Illustrates How Airplanes Could Defend Our Coasts from Hostile Fleets—See Page 377

Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 42 SEPTEMBER, 1924 No. 3

Portable Gas Cabinet Being Used in Treatments with Chlorine Which Is Permitted to Pass to the Patient in Small Quantities That Can Be Inhaled without Risk of Injury

Poison Gases of War to Cure Human Ills

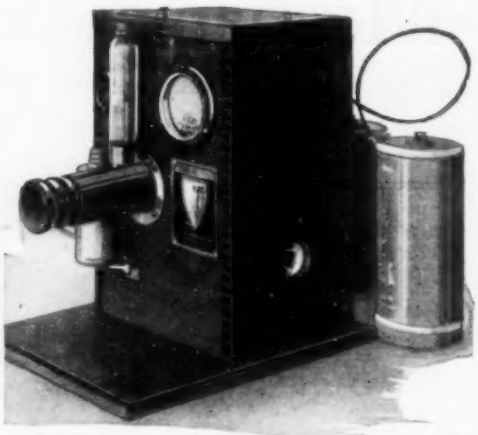
Fumes of Chlorine and Mustard Adopted as Treatment by Hospitals Where They Are Administered from Special Cabinets

POISONOUS gases that wrought so much havoc during the great war may now prove beneficial to mankind because of properties which might be found to cure several of the most malignant ills of the human race. Continued tests are said to be indicating that chlorine will relieve many of the bronchial afflictions which are common in certain seasons and climates. In the early days of the gas treatment for such affections, members of congress and high officials of the government, including President Coolidge, were administered chlorine, with helpful results. The greatly feared mustard gas of the war is being experimented with in the hope that it will prove a remedy for some diseases universally held to be almost incurable.

Although leading medical men have taken up the development of these gases as an aid to the practice of medicine, the chemical warfare service and the medical corps of the army are responsible for the discovery that the gases are valuable for other purposes than those of war. Thus, these same deadly chemicals that were not so long ago weapons of the battlefield have been successfully turned into effective agents for the relief of human ailments.

Hospitals and clinics throughout the United States and Canada have adopted this method of treatment for respiratory troubles and for use in prevention of many more serious diseases. Preparations are even being made to spray the air of churches, theaters, public meeting places and schools with a weakened solution of chlorine, so germs, always thick in such spots, may be quickly killed and the carry-

ing of diseases of the throat and lungs from one person to another there may be prevented. The suggestion has also been advanced that the purifying of air over large cities by these poison vapors may in time be as necessary and usual as the sanitary processes used to clean drinking water.

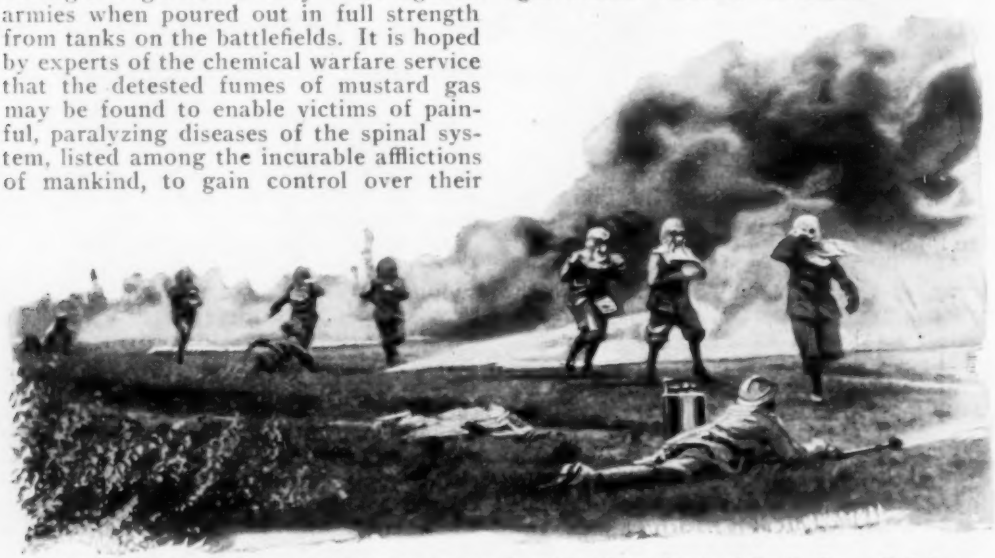


Mixing Device by Which Chlorine Gas and Air Are Formed into Medicinal Vapor

Already gassing chambers have been declared impracticable and means are being sought whereby any doctor may treat his patient with the gases in an ordinary room. Some of the apparatus employed are very simple, one implement consisting of a few bottles which can be easily uncorked to permit the fumes to escape slowly. Such appliances as this may soon become part of every physician's equipment to be carried about with his other supplies while he makes his rounds among patients.

The success achieved with chlorine and mustard gas in the relief of severe minor ills has caused scientists and medical men to experiment with other dread war gases to find whether they, too, in small quantities, might not prove as effective against contagious germs as they were against armies when poured out in full strength from tanks on the battlefields. It is hoped by experts of the chemical warfare service that the detested fumes of mustard gas may be found to enable victims of painful, paralyzing diseases of the spinal system, listed among the incurable afflictions of mankind, to gain control over their muscles after they have felt the influences of the ailments, and chemists and physicians are expecting the announcement of the discovery of a combination of chemicals that may end the spread of the "white plague."

Research is steadily going ahead with these purposes in view. But the fact that chlorine gas acts as a curative agent in certain diseases of the breathing organs has been known for some time. Almost ten years ago a German scientist reported that inhaling of slight doses of chlorine was used successfully to clear up meningitis and diphtheria carriers. It is said that when the influenza epidemic struck the Edgewood arsenal of the government during the great war, the hospitals were crowded with sufferers. However, no cases were recorded from among the operating force of the chlorine plant, although every other branch of service had its full percentage of victims. Even on the battlefronts it was noticed that when the "flu" broke out, thousands of men in the military camps were prostrated by it, but those troops who had been exposed to gas attacks suffered the least.



Beginning of a Gas Attack on a Battlefield during the Great War When Clouds of Deadly Fumes Rolled over the Armies with Disastrous Results to Those Not Masked

Ants Raised to Aid Fruit Growers in Combating Insect Pests

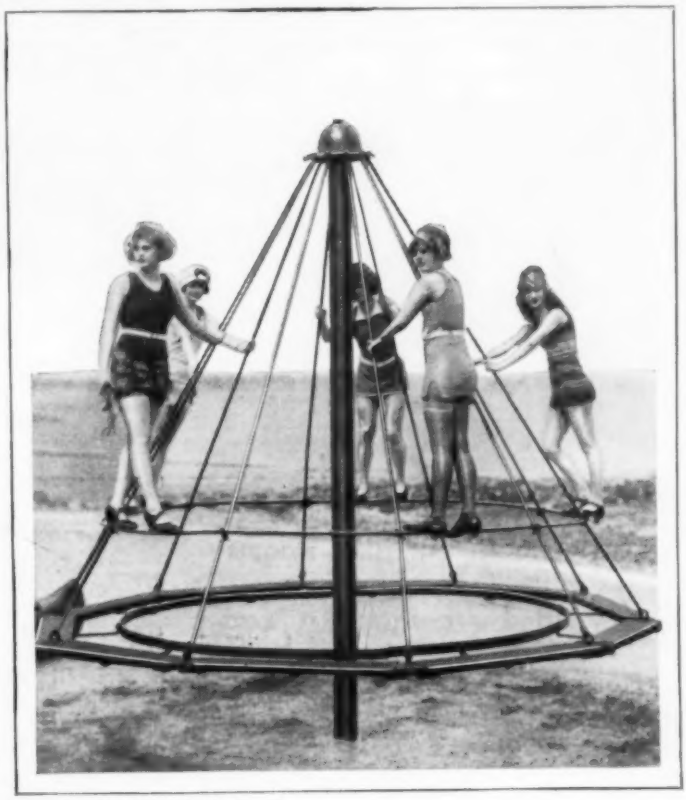
To help California fruit growers exterminate the insects that damage their trees, a Texas man has devised a method of hatching tiny black or red ants, which are known to thrive on the eggs of the pests, in a sponge "incubator." To entice the ants into the sponge, it is saturated with melted sugar and swung from the limb of a tree on the "farm." A week or two later, when the weather is favorable and the myriads of ants have left their porous nest in search of food, it is slipped from the branch and incased in a special container for shipment to California. There it is hung onto an orange or other fruit tree in the grove and soon its burden of eggs is hatched and thousands of tiny ants launch their drive on the pests.

Bookcase and Table Combined

Of novel design, a library or hall table, which solves the problem of disposing of books in a hall or living room in a convenient manner, has recently been brought out in England. The table top is circular, but the lower part square. On the four sides shelves of various heights are fitted, which allow books and periodicals of widely different sizes to be stored. In this way reading material is available at a moment's notice, and yet everything can be cleared away instantly without having to carry the books to a shelf in a far corner of the room. To hold the books at a convenient level and to protect them from damage, a false bottom is fitted which elevates the lowest shelf several inches from the ground.

Beach Merry-Go-Round Adds to Fun of Seashore Sports

To add to the attractions of the seashore, beach merry-go-rounds have been built at some resorts on which young and old find amusement when not in the water. The apparatus consists of an upright pole sunk in the sand and topped with a large inverted metal cup from which rods are suspended that hold boards forming a continuous seat in the shape of a large wheel. Circular braces keep the rods spread out toward the bottom. When rapidly turned, the wheel sways in addition to going around, the double motion increasing the enjoyment of the sport.



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Seashore "Fans" Enjoying Whirl Aboard Beach Merry-Go-Round Which Rocks and Sways as It Revolves about a Standard Planted in the Sand

¶Thirty-five pigeons were defeated by an airplane in a race from Miller field, Staten Island, to Washington, recently, the plane leading the fastest bird by one hour and eleven minutes. The pilot and three of the pigeons carried invitations to government officials to attend a benefit garden party in New York.

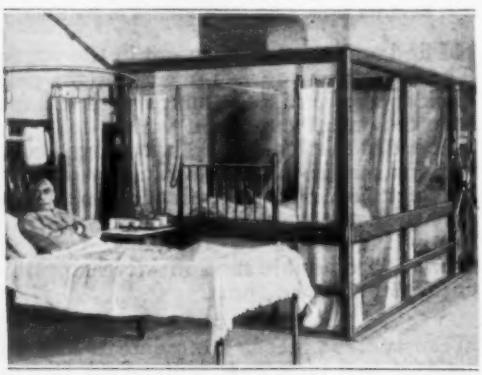
Etienne Oehmichen, French Engineer, and His Helicopter on Its Prize Flight of Over a Mile

Flight of Over Mile in Helicopter Wins Designer a Prize

By flying more than a mile in a large helicopter which he had designed, a French engineer not long ago was awarded a prize of over $5,000 and encouraged to still further efforts to perfect a heavier-than-air machine that will make perpendicular ascents and descents. In the test, it described a circular course and kept at an even altitude as it glided over the field, controlled by its designer at the "stick." It was supported mainly by a series of large, deeply curved propellers, while forward motion was supplied by smaller ones. Engineers for several years have been striving to produce a practical machine of this type to solve some of the problems now encountered in landing and taking off with the ordinary airplane.

Patients Sealed in Glass Rooms Are Fed Oxygen by Pump

For treating patients with oxygen, a sickroom of sealed glass has been installed by a London hospital in which double the amount of the gas usually found in the air is supplied the occupant. Special apparatus also is furnished to keep the atmosphere pure and there are no openings that might permit entrance of any impurities. Oxygen is pumped into the case through a tube. It is believed the ward will serve to stimulate persons while under treatment for wasting and weakening ailments.



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"Show-Case" Sickroom of Hospital Where Oxygen and Pure Air Are Pumped to Patient

Great Increase in Farming Lands Is Seen in Next Fifty Years

To feed the 150,000,000 population which it is estimated the United States will contain by 1950, approximately 38,000,000 acres must be added to the present crop-producing lands in this country, government statisticians declare. The extra acreage, it is figured, would suffice for domestic consumption and still leave a surplus for export. An increased yield per acre was taken into consideration in arriving at these figures. There are said to be between 400,000,000 and 600,000,000 acres of potential crop land, of which some 220,000,000 acres lie in the forested regions of the eastern part of the country.

Sun Valve Gives Automatic Control of Electric Traffic Lights

Designed to automatically control electric street-traffic signals by turning on the current at approaching darkness and shutting it off at daylight, an electric sun valve was described in a report read to the National Electric Light association convention. The valve operates by the use of selenium and turns the electric current off and on as the visibility becomes high or low. The report dealt with the use of the device in connection with various types of traffic signals, ranging from the control towers used in large cities, down to the automatic crossing beacons.

Electroscope Locates Radium under Concrete Walk

With the aid of a gold-leaf electroscope, an instrument for measuring the value of radium, a woman expert in the bureau of standards recently found a thousand dollars' worth of the substance among some ashes in a can under a concrete walk after it had been lost for weeks. So eager was she to retrieve the precious metal that she emptied the can on a floor and handled the radium barehanded, escaping without injury. This is said to be the first time in the history of the bureau that an employe has worked with it unprotected from its rays. Since the discovery of radium the young woman has measured $4,000,000 worth with the electroscope.

Radium Expert in Bureau of Standards Measuring Value of Metal with Gold-Leaf Electroscope

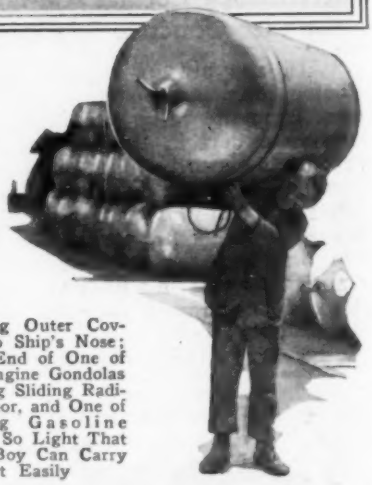
Railroad Carries Ships Overland with Passengers and Cargoes

So that vessels may carry their passengers and cargo overland between separated bodies of water, a railway ship canal, consisting of sluices, inclined planes and large, specially designed railroad flat cars, has been built in Germany. When a steamer reaches its terminal, the flat car is rolled on rails down an incline into the water and slipped underneath the boat. It is then drawn back up the slope and, with the ship on top, is transported to the next body of water into which it runs far enough to permit the vessel to float. This line was built to provide communication between East Prussia and the different bodies of water from which it has been cut off by the new divisions of territory resulting from the war.

Flat Car Carrying Ship down Incline to Launch It in Deep Water after Transporting the Craft over Land

Beginning of the Sheep Industry

Sheep are said to have been unknown in the domesticated state in America until after the Spanish conquest, with the beginning of the industry in the new world dating back to the time of Cortez and his rule of Mexico in the early part of the sixteenth century. Nearly all Mexican sheep can be traced to early Castile breeds which, it is said, were also the source of supply of the first flocks in the western part of the United States. It is believed that the English colonists first brought them to Virginia in 1609. Originally all sheep probably came from Asia, but the American breeds sprang from stock imported from Europe.



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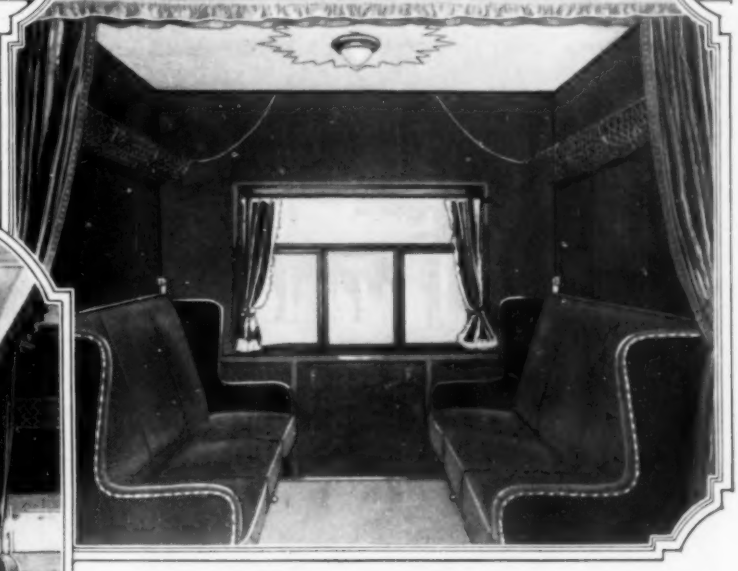
Applying Outer Covering to Ship's Nose; Front End of One of Five Engine Gondolas Showing Sliding Radiator Door, and One of the Big Gasoline Tanks, So Light That Small Boy Can Carry It Easily

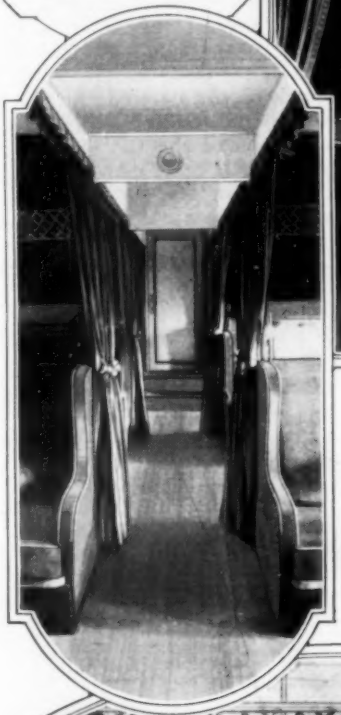
Giant Liner of the Air to Provide All the Modern Luxuries

Surpassing the mighty "Shenandoah" in size and in the luxury and completeness of its equipment, the "ZR-3," the latest addition to Uncle Sam's navy from the works of the Zeppelin company at Freidrichshafen, Germany, is considered the pinnacle of modern heavier-than-air construction. Planned exclusively for passenger and light freight service, the ship, now the property of the United States under the terms of the reparations agreement, has been fitted with conveniences that rival any found in hotels or Pullman cars. Sleeping and seating accommodations are provided in a special cabin on the underside of the hull and about ninety feet from the extreme point of the bow, and have been planned with a view to privacy and comfort. Completely equipped toilet rooms, a radio chamber, buffet and kitchen in which all food is cooked by electricity, and the navigating room containing the steering wheel, compass and charts are included in the passenger cabin. Accommodations for the officers and crew are furnished within the hull of the ship along the sides of a central corridor and here are also twenty compartments for baggage, mails and cargo.

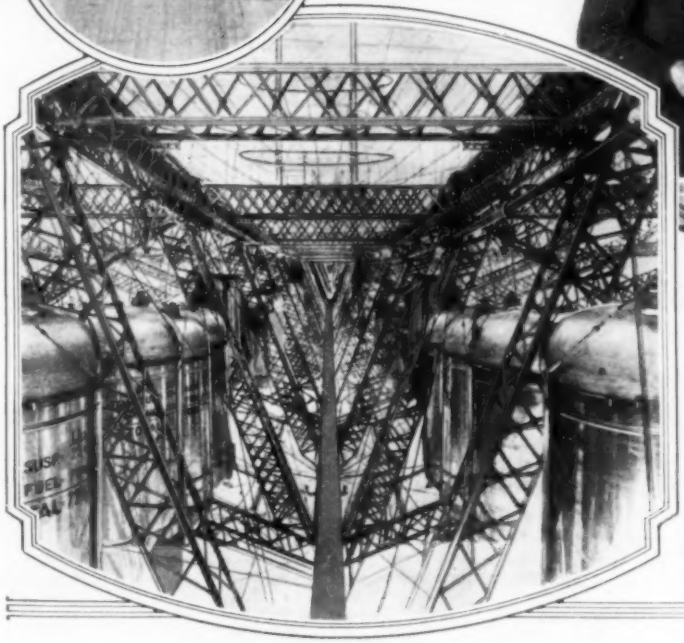
Mechanically, the "ZR-3" is the most powerful airship ever built, having five twelve-cylinder Maybach engines giving a total of 2,000 horsepower. The motors are reversible, are all connected directly to the propellers and each is housed in a separate car. The ship's storage tanks have a capacity of seventeen tons of fuel and the dirigible will have a cruising radius of from 3,480 to 5,121 miles depending upon the number of engines used. A full-power speed of seventy-five and eight-tenths miles per hour and a normal rate of sixty-seven miles are planned.

Luxurious Compartments in Passenger Cabin of "ZR-3" Are Finished in Soft, Rich Upholstery of Skillfully Blended Tones to Add to Comfort of Journeys by Airline





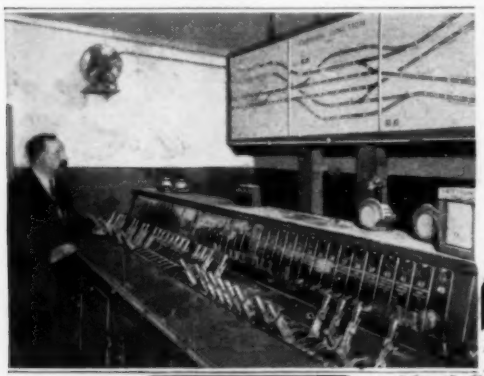
Curtained Corridor Like Aisle of Pullman Sleeper Extends Full Length of Sunny Cabin Aired and Lighted through Broad Windows; At Right, Dr. Eckner, President, and Dr. Durr, Managing Director, of the Zeppelin Company, Who Had Charge of Building the Mighty Ship



Looking down Interior of Hull along Central Passageway; Suspended on Each Side among the Network of Aluminum-Alloy Girders Are Some of the Tanks That Feed the Ship's Five Powerful Engines; Thirty Additional Tanks besides the Regular Seventeen Tons' Fuel Capacity Were Provided for the Atlantic Flight

Oldest Electric Tunnel Is Extended by Use of Boring Shield

Deep down under the streets of a great city there is a roaring of air and a clanging of steel doors, and the lurid glare of electric lamps lights up the white faces and grimy overalls of men who are crawling under the rings of a tunnel to the shaft head of new workings. They enter the brilliantly illuminated interior of a large cylinder forming part of a remarkable device, called the "Greathead shield" after its inventor, an English engineer. This shield has superseded the more costly system of timber supports, which characterizes mining operations in loose ground. Hydraulic jacks are placed close to this cylinder, or "skin" as it is styled, and parallel to the axis of the tunnel. A grinding noise comes from the front of the shield, where the resistless edges are cutting through the earth. Men are here at work under an air pressure much higher than that of the atmosphere above, for an inrush of water has to be held at bay and kept from flooding the tunnel. Tunneling in compressed air in the bowels of the earth is attended by the same dangers for the workers as diving in the depths of the sea to raise a sunken liner. In each case, nitrogen bubbles tend to form in the body tissues. No man working in compressed air is allowed to go into the open air until he has spent some time in chambers containing air at successively reduced pressures. The boring shield was invented to aid in modernizing the oldest underground electric or "tube" railway in the world — the "City and South London" — dating from 1890, and linking it up to more up-to-date subway systems. Junctions had to be made with two other underground lines, and none of these could be crossed on the level because of the density of the traf-



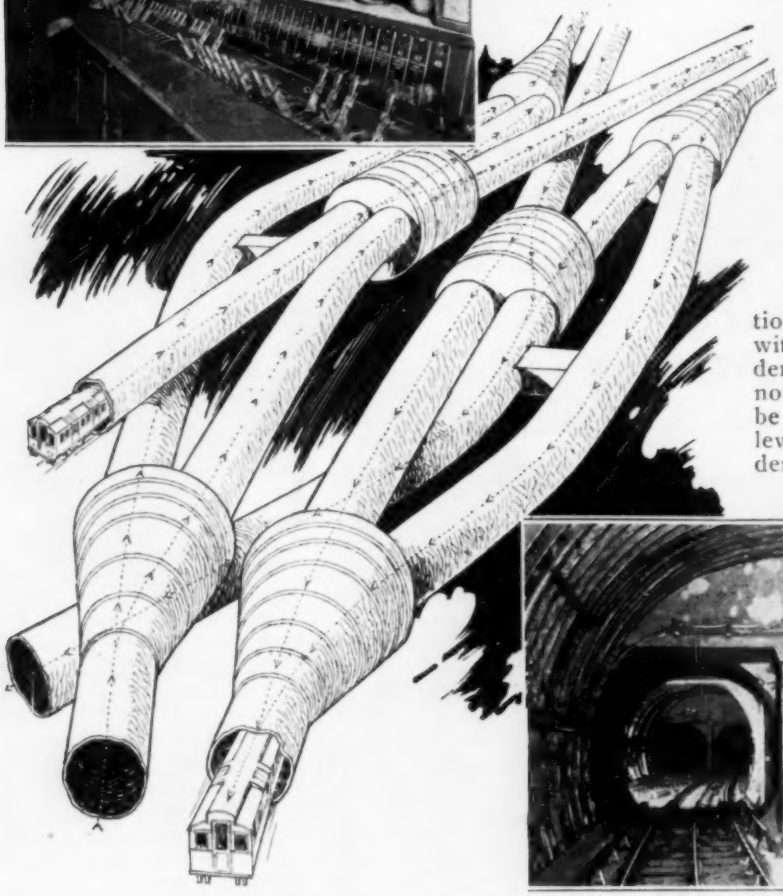


Diagram of Intersecting Underground Railway Tubes; at Top, Control Set Which Governs Automatic Switch and Signal System, and, Below, Inside the Tunnels at Junction of Tracks

tic. Moreover, the mechanical operations necessary were restricted to four to five hours after midnight. The diagram reproduced shows how this was done by the device of "burrowing" or flying junctions which took seventeen months to make. In the operation of trains, a device known as the "dead man's handle" is used to protect passengers. This brings the coaches to a full stop the instant the engineer's hand is removed from the control lever. The brain of the underground is its signal box or cabin from which both switches and signals are controlled. Movable disks on an illuminated diagram show the signalman the state of the lines in his neighborhood, and the destination of each train. He can thus give it the required path, and he is in telephonic communication with the junctions, should an accident occur or emergency require it.

Wooden Horse Gallops on Rubber Wheels

Solidly constructed, a wooden horse that gives a galloping sensation when moved, has been invented as a child's toy. Mounted on three steel disk wheels, the one in front is off center to produce the up-and-down motion, and all are rubber-tired so they cannot mar the floors. Made of hardwood with no glued joints, the toy will stand rough handling and is claimed to be so balanced that it will not tip over.

Galloping Hobbyhorse Toy on Wheels, Rubber-Tired to Prevent Marring Polished Floors

Copyright, Ewing Galloway

Harvesters in Spain Climbing Tall Trunks of Date Trees to Gather Yields of Fruit from among Palms

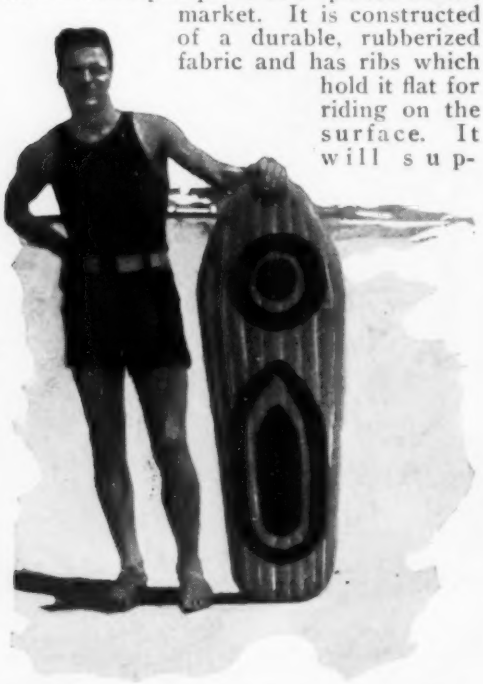
Date Pickers "Walk" up Palm Tree to Harvest the Fruit

In date-growing countries where almost primitive methods are still practiced in harvesting the fruit, natives climb to the top of the palm, sometimes 100 feet high, aided only by a short rope. Looped around the tree and the body of the climber, the belt is lifted repeatedly as the man "walks" up the trunk. Reaching the top, he leans back in the loop while pushing against the tree with his feet and is supported much in the manner that a lineman is when working on a telephone pole. In this way he is free to use both hands to gather the dates. These are lowered to the ground in baskets.

Bass have proved themselves to be good fathers, according to a report made by a state conservation commission. The black variety will guard its young after hatching and will defend its shoal against big odds, having been known to attack the pickerel and pike when they swim too close to its swarm.

Pneumatic Boards for Surf Riders Are Safe and Easily Carried

For those who enjoy the sport of surf riding, a pneumatic board that is inflated with a hand pump has been placed on the market. It is constructed of a durable, rubberized fabric and has ribs which hold it flat for riding on the surface. It will support the weight of a heavy person. When deflated, it folds up into a small bundle weighing about six pounds, and is four feet eight inches long and twenty inches wide when blown up. It is said to be safer for the rider and other bathers than those of wood and cork. Bright-colored designs give the new boards a festive touch.



Gay-Colored Pneumatic Surf Board Inflated; Note Rib-like Structure and Size

Banana Fiber Cuts Cost of Pencils as Substitute for Graphite

Owing to the increasing cost of graphite, European experts are busy with several substitutes calculated to cheapen pencil production. One of these consists of banana fiber. After the waste is burned in retorts, it is crushed and then mixed with what is technically known as "binding" to give it a gluey consistency and to improve its marking qualities. The whole is then worked up into pulp by machinery, and when partly dry, is crushed again and forced through molds under considerable pressure. The rolls are then baked, cut into lengths and packed with great care in cast-iron crucibles and kept at red heat for two hours. After cooling gently, the "leads" are ready for the wood.

Man-Power Flying Near Is Belief as Result of Gliding Tests

Flight by human muscular power will become a reality before long, in the opinion of a German scientist. The discovery that airplanes could be driven by gasoline temporarily halted experiments in flying man-propelled machines, but the results achieved by gliders, he declares, give new encouragement to the idea. The planes will have to be built extremely light, although at the same time strong enough to stand the strain, and the legs will have to be the driving force as the hands will be necessary for guiding. The scientist pictures the machine as a biplane, in the center of which the flier sits, on a structure looking much like a bicycle, and drives a propeller in the rear.

Poodle's Long Curls and Quick Wits Win Prize at Dog Show

Prize winner at an English kennel-club show, "Captain Swift," a poodle, attracted the attention of judges and spectators because of its intelligence and long, carefully curled coat. This breed is said to be the cleverest of all domesticated dogs and has long been a favorite as a pet and circus performer, although fanciers declare that in recent years, they have been supplanted somewhat by varieties with shorter hair as the latter are more easily groomed.

Prize-Winning Long-Haired Poodle Proudly Wearing Ribbon Awarded at Kennel-Club Show

Law's "Eye of the Night" Signaling to Police Patrols, and Raising the Searchlight to Its Place

Giant Searchlight in War on Crime . . to Aid Hunt for Bandits . .

To aid the Philadelphia police in catching criminals, a huge searchlight of 300,000,000 candlepower has been installed in the tower of the city hall, 400 feet above the street. Specially designed for the purpose, it throws a beam of light that can be seen fifty miles. The city has been divided into four sections and each section subdivided. The moment news of a crime reaches a police station, it is flashed to headquarters in the city hall with the number of the section and the location of the subdivision. The rays of the searchlight are then directed upon that district, followed by flashes of light, signaling to all patrolmen that a crime has been committed and indicating the district. At the same time squads of police close in on the section from other parts of the city so as to hem in the criminals. Different colors can be flashed by pressing a button, and it is expected that this feature will be utilized in directing traffic in the most congested streets during the day.

New Alloy to Speed Up Cables

Discovery of a new alloy, called permalloy, possessed of such remarkable magnetic properties that it will accomplish results heretofore believed impossible and, used in the manufacture of submarine cables, will permit messages to be transmitted at a speed many times that now obtainable, was recently announced by research engineers. The new substance is described as being one of the many results of modern methodically planned research and has proved practical after repeated tests, giving "new wind" to the cable, with advantages of control and privacy, in its race with wireless as a message bearer. It is an alloy of nickel and iron.

¶Giant bees of India build honeycombs that are eighteen feet high.

Weights and Measures "Sleuth" Checking Up on Honesty of Pushcart Vender's Scales While the Owner and "Gallery" of Curious Bystanders Await Outcome of Test

Guarding Your Dollar against Short Weights

Full Measure in Purchases Insured Buying Public by Watchful "Sleuths" Who Detect Incorrect Scales and Yardsticks

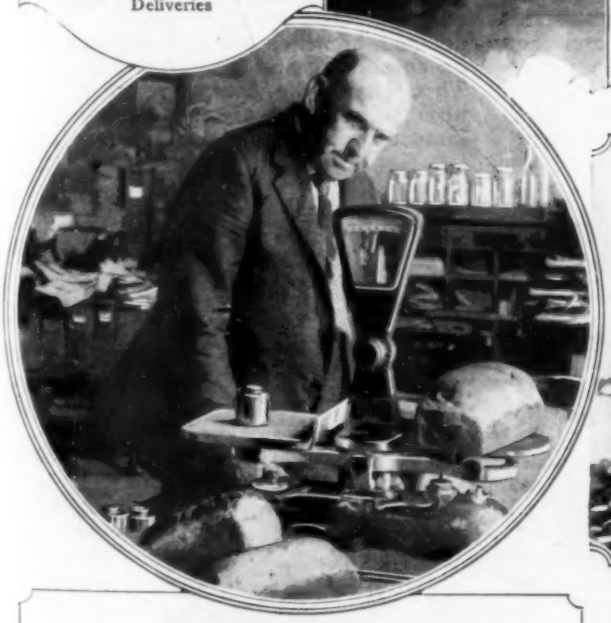
DEFENDING the pocketbook of a buying public against faulty measuring instruments and unscrupulous dealers who "fix" their scales or shorten tape lines to gain a few cents of illegitimate profit on each sale they make, inspectors enforcing the weights and measures law of Washington, D. C., have tested more than 65,000 devices in that district in a single year.

Appliances of every description, used in the buying and selling of commodities, are included in these tests, and offenders ranging from immense corporations to obscure pushcart venders have received reprimands and penalties for failure to comply with the regulations. The inspections take in weighing machines of butchers, grocers, druggists, coal yards, dairies, coin-in-the-slot vending apparatus, and measuring tapes and yardsticks of dry-goods stores. If the appliances are correct, they are stamped and sealed with a label bearing the date of examination. But where they do not conform to the rules of the law, they are tagged "condemned," and are confiscated by the authorities who destroy the machines and penalize the owners.

Store-to-store inspections are laid out and men and women agents of the bureau of weights and measures, acting as "buyers," make purchases of bulk articles in the sale of which dishonest traders generally resort to short weights. Ice wagons are checked up as their attendants are weighing out pieces for delivery along streets, and at any moment a milk cart may be stopped by a stranger who demands to see one of the bottles used as containers. If the block of ice or jar of milk is found to consist of a smaller quantity than is paid for by the buyer, the driver of the wagon is arrested and his employers summoned into court to answer to the charge of cheating.

Examining Milk Jars for Short-Measure Evidence; Omissions of Two or Three Thimblefuls from Each Quart Would Result in an Amazing Total for a Day's Deliveries

Inspecting an Automatic Pump at a Gasoline Filling Station to Insure Automobile Owners Full Gallons in Their Fuel Purchases



Bread Scales in Laboratory of Bureau of Weights and Measures in Washington Where Records Are Kept of Both Big and Little Bakeries

Inaccurate Scales Used in Filling Prescriptions by Druggists, Who Were Haled into Court after Their Appliances Were Seized and Destroyed

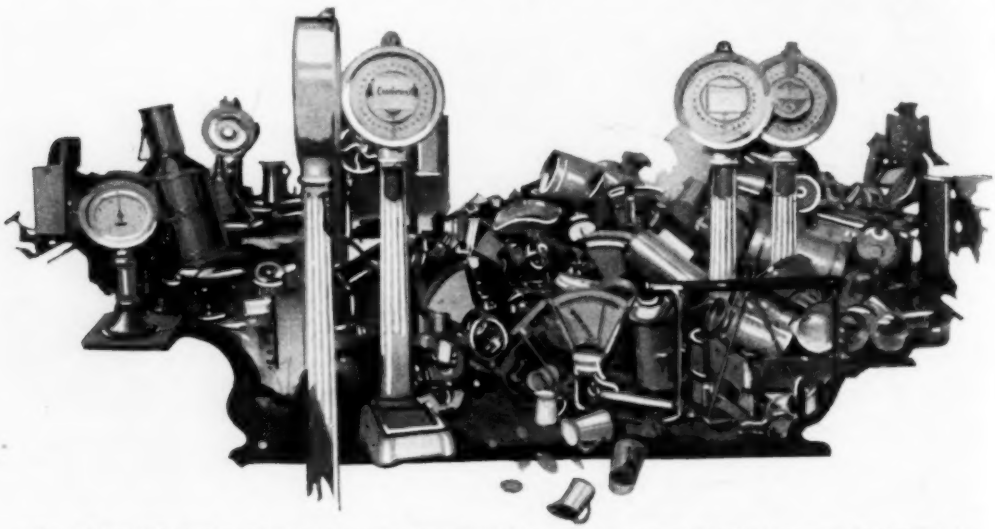
Quite a number of errors exist in measuring implements unknown to the dealer, and in such cases, when discovered, he is reprimanded and instructed in the methods of testing his own machines. Where corrections can be made in the device without demolishing it, it is adjusted by the inspectors and the cost of the work collected from the owner. Recently two large shipments of new milk bottles were smashed by inspectors and thrown into the river because they were two drams short of the amount marked in the glass. The shortage for each bottle represented only about enough cream for a cup of coffee, but the authorities decreed that customers were entitled to the full amount for which they paid.

A large amount of short weighing, it was found, was done among dealers in fruits and vegetables, but now such commodities must be sold in standard containers, or by weight or count. The packages are regular shipping containers and the law requires that they be compactly filled. Formerly the practice was widespread among some dealers to remove a portion of the contents before sale and make seven or eight "light" bushels where six full ones had existed. Fruit hampers had raised bottoms and berry baskets were pinched in at the sides or had middle hoops to displace a quantity of the article. The buyer would not learn of this until the package was emptied, and then it was generally too late to have a correction made. Now all barrels and boxes for this class of produce must be made according to sizes specified in the regulations.

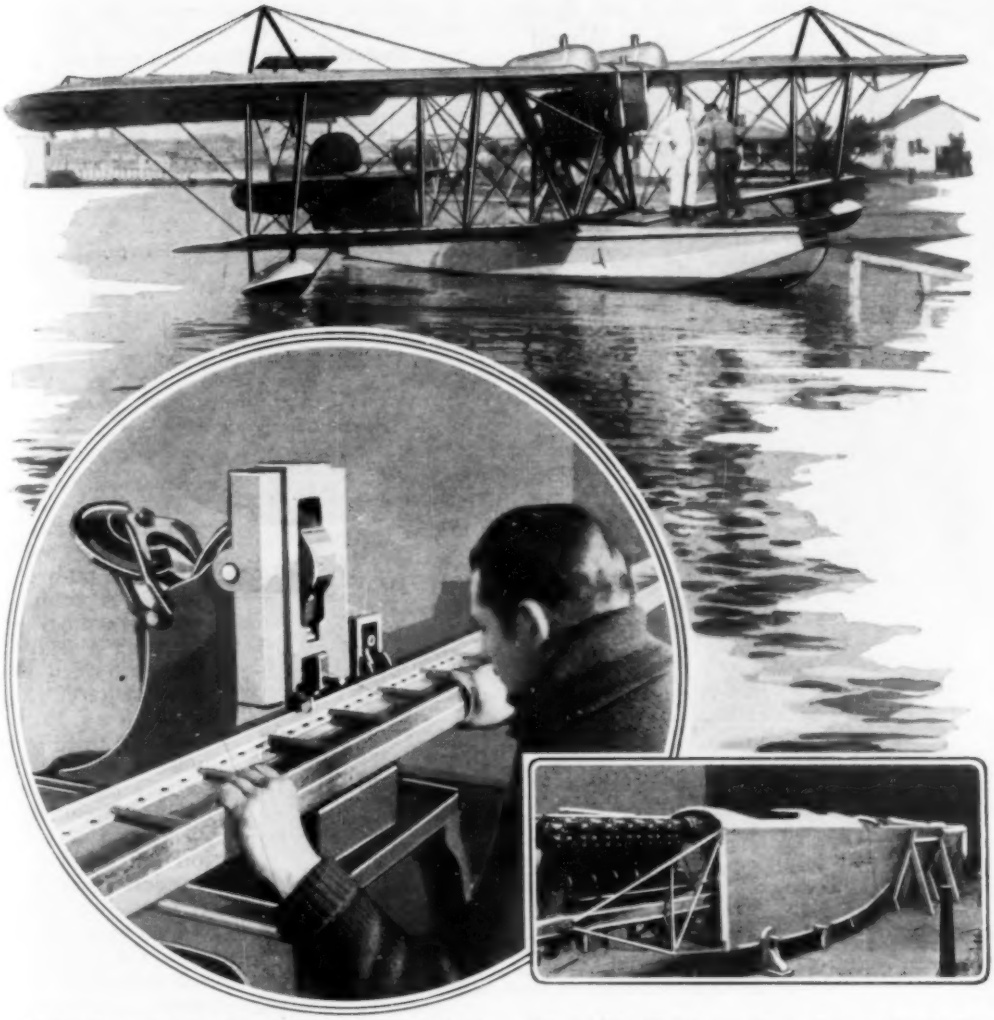
"Shucked oysters" must be sold by liquid measure or by count, and if the seller allows more than ten per cent of fluid to be present in the quantities, he is open to charges of cheating. One vender of oysters, delivering an order to a customer, was amazed to see his patron unwrap a glass graduate measure he had concealed and pour the liquid from the holder into the vessel. The test showed thirty per cent liquid in the purchase, and the dealer was ordered to appear in court.

Various commodities are constantly being purchased by "shoppers" for the inspection bureau. These buy food articles, ribbons, dress goods, household linens and almost everything that can be sold by weight or measure. Innocent-looking automobiles are driven about the gasoline filling stations by watchful detectors of dishonesty, who order a quantity of "gas" put into the car. Instead of running into the fuel tank, the liquid passes into a hidden container and is later measured at the laboratory, where proof of the dealer's guilt or innocence is quickly shown by accurate measures. After this campaign complaints to the bureau from car owners dropped.

In one year of inspections, tests were made of 19,238 scales, 22,098 weights, 2,262 yardsticks, 9,802 measures, 1,766 automatic gasoline pumps and 6,996 drug and jewelry weights. Of these, 2,365 pieces were condemned, of which 665 were beyond repair or correction and had to be destroyed. Throughout the campaign to eliminate unfair methods almost every scheme known for falsifying weights was found.



"Junk Heap," Collection of Falsified or Incorrect Weighing Appliances and Liquid Measures Confiscated by Authorities in Campaign to Eliminate Unscrupulous and Careless Dealings among Shopkeepers



Flying Boat with Fuselage and Hull Built of Aluminum Alloy; Left, Working on One of the Light Metal Girders, and Right, Airplane Body in Course of Construction

Aluminum Given Strength of Steel for Building Metal Aircraft

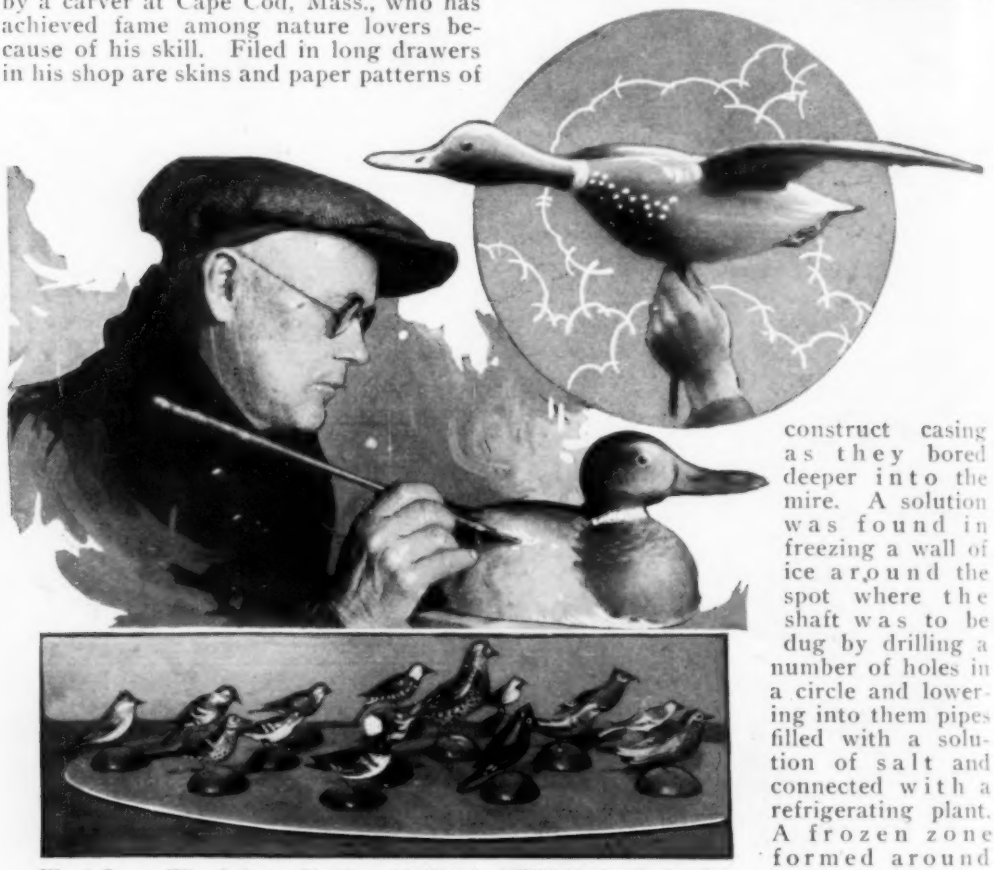
Aluminum alloy, treated to give it resistance to corrosion, is being manufactured by an eastern company for the construction of airplane and flying-boat bodies. It is said to have about the same properties as low-carbon steel although it weighs only one-third as much. It withstands a "pull" of 55,000 pounds and costs about the same as brass. It is hardened by heating to between 920 and 960° Fahrenheit and is then immersed in cold or warm water and allowed to "age" for about an hour before it is riveted. For flying boats, the alloy has been found especially practical as it resists the action of salt water.

Butterflies Hamper Auto Traffic by Plugging Up Radiators

Swarms of beautiful red butterflies are reported to have seriously hampered automobile traffic along southern California highways by filling crevices in the radiators, thus causing overheating of the engines. In some cases, motors were badly damaged when drivers pushed on without sweeping the insects off or investigating the cause of the trouble, and many vehicles were stopped while the butterflies were removed. Scientists attributed the swarms to lack of food supply in the mountain regions, where a dry winter had caused many plants to wither and die. The insects therefore migrated to the valleys.

Carves Lifelike Models of Birds from Patterns Traced in Wood

Birds of all sizes are shaped from wood by a carver at Cape Cod, Mass., who has achieved fame among nature lovers because of his skill. Filed in long drawers in his shop are skins and paper patterns of



Wood Carver Who Imitates Birdlife, with Model of Wild Duck; Study of a Fowl in Flight and Group of Small Specimens

practically every bird found along the Atlantic coast. Outlines are traced from the patterns on cedar that has been seasoned for ten years. The shape is then cut out, first by a small saw and then with a common jackknife. Long bills, extended wings, tails and legs are carved separately and glued on later. The model is sandpapered to a smooth finish and the feather marks and eyes of beads or glass added. With the preserved skin as a model, the wooden bird is painted in the exact colorings and markings of the original.

Ice Serves as Concrete in Sinking Shaft to Coal under Swamp

To sink a shaft through 6,000 feet of swamp in order to reach the deposits of coal in the northern part of Belgium was a problem that challenged the skill and resourcefulness of engineers. Menaced and obstructed by the sand and wet marl, workmen found it next to impossible to construct casing as they bored deeper into the mire. A solution was found in freezing a wall of ice around the spot where the shaft was to be dug by drilling a number of holes in a circle and lowering into them pipes filled with a solution of salt and connected with a refrigerating plant. A frozen zone formed around each tube that continued to widen until it connected with the adjoining ones. When the "wall" was completed the unfrozen earth inside was removed without difficulty. Freezing is transmitted differently to different strata, and to water which may be standing or gushing or of varying degrees of saltness.

"Ghosts" Millionth of Inch in Size Are Routed by Scientists

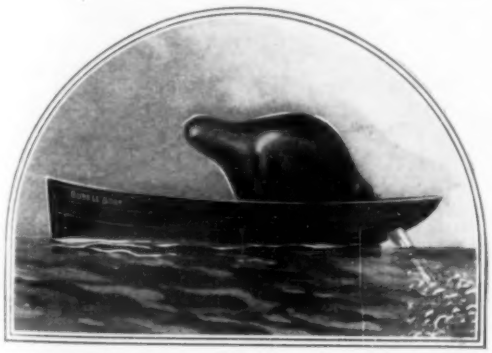
"Ghosts" that have baffled scientists using a Rowland's ruling machine, a device employed in studying the nature of light, have been routed with the discovery that they were caused by errors of a millionth of an inch in the rulings of the point of the sensitive apparatus. These, it was found, were caused by the heat of the human body in the same room.

Electric Bricklayer Does the Work of Nearly Twenty Masons

Electrically operated, a bricklaying machine that lays 1,200 bricks an hour, against 500 a day for the average mason, has been invented. Upon rails placed around the outside walls of the building, a traveling boom is set, and upon this are the mortar tank and laying mechanism, driven by an electric motor. A wheel rotates, taking two bricks from the carrier, while another wheel spreads mortar as the carrier moves along the boom. At the end of the wall the machine changes direction and proceeds as before, until it has laid one row entirely around the structure. The boom is then raised and another trip begins. Three men are required to supply the device, which is said to do the work of nearly twenty masons.

Air from Balloon Drives Toy Boat

Moved by the air exhausted from a rubber balloon, a toy boat travels several feet before the elastic bubble collapses. The air is allowed to escape at the stern end and causes a string of bubbles which make a sound similar to that of a motorboat when they burst on the surface. After each performance the balloon may be blown up again to give "power" to the toy.



Toy Boat Propelled by Escape of Air from Balloon

Asphalt Lining in Irrigation Canals Stops the Loss of Water

Lining irrigation canals with asphalt to increase their capacity, prevent seepage and reduce maintenance costs has proved a success in the west, where the material is applied like paving, sand and rock dust being the principal substances added. After the mixture is heated, it is spread to the desired thickness and then compressed with rollers, tampers and irons to give it a smooth waterproof surface. No curing is needed. Asphalt also is said to be an excellent material for repairing and relining canals with cement interiors, as its elastic qualities adapt it to extremes of temperature and prevent breaking and cracking. In the construction of canals for power purposes, such a lining permits steeper slopes and the full benefit of the current is obtained. Breakages seldom occur in asphalt-lined ditches and losses due to water-logging of adjacent valuable lands are avoided.

Applying Asphalt Coating to Bed of Irrigation Canal, Using a Heated Roller to Distribute and Compress the Material Evenly over the Surface

¶Experiments have proved that moles may be controlled by placing teaspoonful quantities of concentrated lye in their runways at twenty-five to fifty-foot intervals.

Kafirs, Natives of South Africa, Some of the 4,000 Toilers Who Glean the Precious Rough Diamonds from Their Places in the Rocky Depths of the De Beers Mines

Fires of Diamond Revealed by Dust and Steel

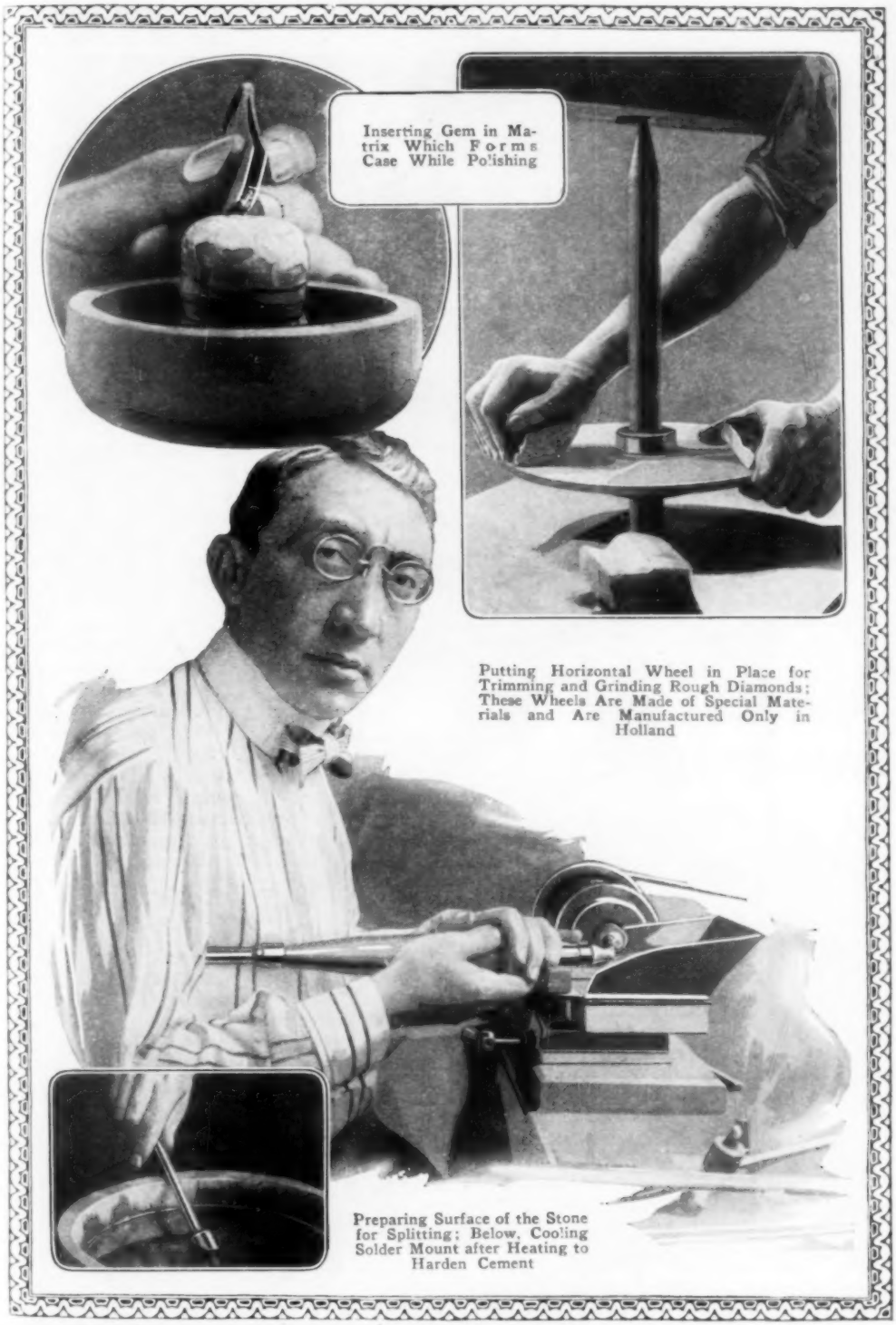
Raw Gems Given Glitter of Beauty at Hands of Skilled Craftsmen in Mills of Old Amsterdam

BEFORE the war the busy city of Amsterdam, Netherlands, had rivals for its place as leading export center for the world's diamonds, but for the past few years has been the chief point of distribution for the gems, besides being the main polishing and cutting source from which finished stones are obtained.

Within the city are between seventy-five and a hundred factories operating almost 10,000 dressing mills, and as many skilled workmen in charge of them. Wages are said to be good and employment for the diamond experts steady the year around. In all, more than 50,000 people derive their livelihood from this industry, toiling in the many departments of the city's cutting and polishing establishments.

Coming from the mines of South Africa or diggings situated at several other far-off points of the earth, the rough stones are subjected to harsh treatment in order to prepare them for the processes which reveal the scintillating beauty and brilliance that make these gems the most popular of jewels. After splitting, a hand operation performed with a steel tool inserted at a faulty spot, all weak portions are trimmed off by means of bronze saws and diamond dust, if the stone is of the hard variety, otherwise the same splitting implement is used.

The task of polishing requires more skill and time than any other operation designed to give the stone its necessary shape and quality. This consists in giving the rounded product the "sides" which account for the brilliant rays that mark the better-quality gems. Shapes of diamonds are divided into five classes, brilliants, eight-cuts, squares, fancies and roses. The brilliant, with fifty-four tiny facets, reflects the most sparkle and is scientifically planned to give all the freedom possible to the rays thrown out from the heart of the stone. The largest facet is known as the table and is to be seen at the top of the finished diamond. The smallest, called the



Inserting Gem in Matrix Which Forms Case While Polishing

Putting Horizontal Wheel in Place for Trimming and Grinding Rough Diamonds; These Wheels Are Made of Special Materials and Are Manufactured Only in Holland

Preparing Surface of the Stone for Splitting; Below, Cooling Solder Mount after Heating to Harden Cement

Centuries of Devotion to the Carving of Millions of Carats of Finest Diamonds Cause Work of Dutch Craftsmen to Be Regarded as a Standard of Skill in Preparing Stones for Market

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Entrance to a Diamond Mine in South Africa, Showing the Shaft Head and Cars Awaiting Loads of Gem-Bearing Soil to Be Scattered in Plots for Air-Curing

culet, is almost unperceivable at the tip of the cone on the bottom. The eight-cut has only eighteen of these minute planes and is generally used on diamonds smaller than a thirtieth of a carat, where the cost of labor would increase the price beyond a reasonable figure. The square, which is said to have added much to art in jewel creations, is at present popular for bracelets, barpins and wedding rings. Fancies comprise marquises, pear-shapes, emerald-cuts, kites and other special forms which are often used in famous gems of great size and quality. Roses are only seen in cheaper grades of the stones, but were formerly the designs of a few of the notable jewels. They are the least brilliant, having the facets on one raised side while the opposite section is flat.

When a diamond is ready for polishing it is soldered into a conical frame of an alloy. The mass is then dipped into a preparation of oil and diamond dust before being fastened with several others on a strong structure that brings it in contact with a horizontal iron wheel. This disk is revolved at great speed and the friction of the stone with its surface, aided by the gritty action of the oil and dust, forms the flat surfaces which slowly appear as the smooth planes of the diamond. One side of the stone is polished at a time, and when finished, the entire series of raw gems must be removed from their places and are resoldered in position for the next facet.

Of the famous historic gems, the Victoria diamond, the Cullinan and the Kohinoor were all cut and polished by workmen in the finishing mills of Amsterdam. The United States receives a greater volume of the city's gem products than any other nation, the total importation of cut and uncut diamonds to this country for one year amounting to 406,553 carats valued at $35,686,606. About one-eighth of these were uncut stones. South Africa produces about $870,000,000 worth of rough gems a year, most of which go to Amsterdam for polishing.

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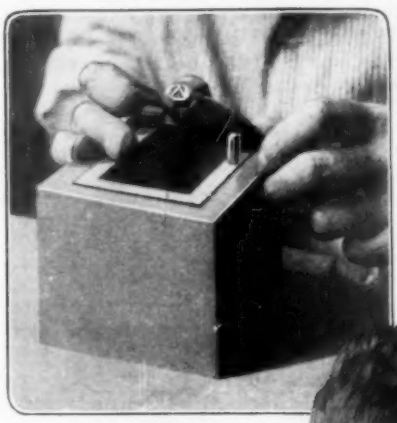
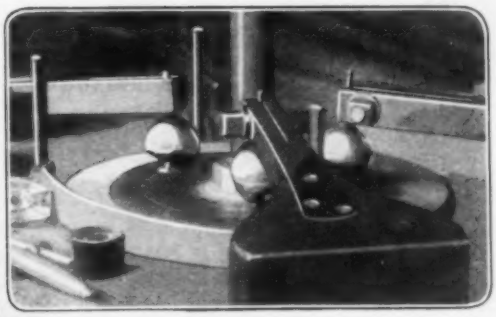
Trolley Cage and Its Operator Bound for the Bottom of a Big Working



Diamond After All of the Soft and Faulty Parts Have Been Removed by the Splitter



Polishing Frame in Which Series of Several Stones Is Held during Single Operation

Setting the Mounts Containing Raw Gems in Holding Frame of Polishing Machine; Left and Right, Shaping the Soft Mold for the Diamond, and Placing the Stone in the Tip of the Cone

Delicate Instruments and Operations to Be Seen in the Diamond-Cutting Plants Which Have Made the City of Amsterdam the World's Chief Source of the Finished Gems

Scoop Conveyor with Endless Belt Saves Time in Loading Sand

For loading sand easily, quickly and without waste into trucks or wagons, a conveyor that carries the material into the

Copyright, Ewing Galloway

Loading Sand into Truck by Scooping It onto Endless Belt of Portable Conveyor

vehicle on an endless belt is being used. Light in weight, the apparatus can be readily backed into the pile and one end of the belt tipped down so that the sand can be scooped upon it. It is claimed that by using the conveyor, two men can fill a vehicle in less time and with less effort than several men working with shovels.

Leaves Used to Make Ice

Although temperatures about Durango, Mexico, are not low enough to freeze water in open streams or uncovered utensils, it is said that when left standing in the cuplike leaves of the century plant, the liquid turns to ice in a few hours. After the flower has bloomed and the sap has been withdrawn, the leaves are laid out in a large straw-covered field during cold weather and filled with water. The ice is gathered in the early morning and stored in adobe buildings where the pieces pack closely and melt together. Cut up into large lumps, it is used for purposes not requiring the artificial product. It is believed that because the leaves are shallow and expose a broad surface to excessive evaporation, freezing is made possible in a climate appearing to be too warm for the ordinary process.

Miners Move Village Twenty Miles When Coal Vein Disappears

Sawing their houses into sections, the miners of an Illinois community moved their town approximately twenty miles. The place was once a prosperous mining center with a population of about 500. In recent years the coal played out, and it was decided to transport the town to another site where a new mine had been opened. The houses were cut into sections in order to transport them across a narrow bridge.

Lavatory on Auto Running Board Carries Water and Soap

Added comfort is afforded the motorist by a patented lavatory fitted under the running board of the car to supply water and liquid soap. The outfit consists of a supply tank, bolted to the frame, and faucets and filler nozzles, which are placed under the hood. The tank has a large

Easy to Wash on Auto Trip with Water and Soap Nozzles on Car

compartment for water and a smaller one for soap. The faucets fold out of sight when not in use.

English Girls in Spirited Game of Balloon Polo; Player Has Just Intercepted the Sphere and Sent It Bounding High into the Air with Blow of Cane

"Aerial Polo" Played with Balloons Adds Novel Thrill to Sport

English girls have given the ancient game of polo a new "twist" by substituting balloons for balls and short canes for sticks. Charging down the field on their ponies, the players endeavor to score by bursting the elusive sphere with a sharp blow of their canes. Considered less hazardous than the regulation style of playing, the sport still provides opportunities for clever riding and skill in keeping the balloon from an opponent's reach, while the caprices of the wind often add to the surprises of the match both for players and spectators.

"Lost" Ocean Current Sought by Test with Deep-Sea Thermometer

Puzzled by a rise of seven degrees in the temperature of a large section of the north Atlantic ocean and by the unusually small number of icebergs reported by steamers, the United States coast guard last spring dispatched experts in oceanography to determine if the Arctic current had disappeared or changed its course. Equipped with a deep-sea thermometer and other apparatus, scientists explored the normal path of the stream, making repeated tests of the temperature of the waters. The theory was advanced that some upheaval in the ocean's floor might have caused a change in the current's course.

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Lieut. Edward H. Smith (in Uniform) and Assistant Taking Temperature with Sea Thermometer

Lightweight Lifeboats for Seaplanes to Save Wrecked Fliers

To aid in saving lives of aviators who might be wrecked while flying over large areas of water, lifeboats so light they can be easily carried on seaplanes have been designed. Strongly built and equipped with oars and rope,

Lightweight Lifeboat Designed for Seaplanes That Face Risks of Flights over Ocean Areas

the boat is said to add but little to the burden of aircraft. In case forced landings in the sea are necessary, when planes become damaged, it can be easily unshipped from its moorings and navigated by one man. Constructed with a wide beam, the lifeboat can safely negotiate ordinary rough seas.

Lights Warn Trains of Landslide and Show Exact Location

Electrically operated, a device that gives warning by flashing red lights when a landslide has occurred along a railroad right of way, has been invented in New Zealand. Two boards, kept apart by spiral springs and connected to a battery, are placed between the rails at points where slides are likely to happen. Wires from the device run along the track in both directions to red electric lamps. A pressure of ten pounds is sufficient to bring contact points on the plates together, completing a circuit with the result that the red warning lights will be illuminated on either side of the obstruction, while a white light will show the exact location of the slip. The device can also be made to throw a switch to warn the engineer. Connected with the nearest station, the signal can be received there before the arrival of a train, giving additional time to clear the road.

Casters of Fabric Prevent Noise

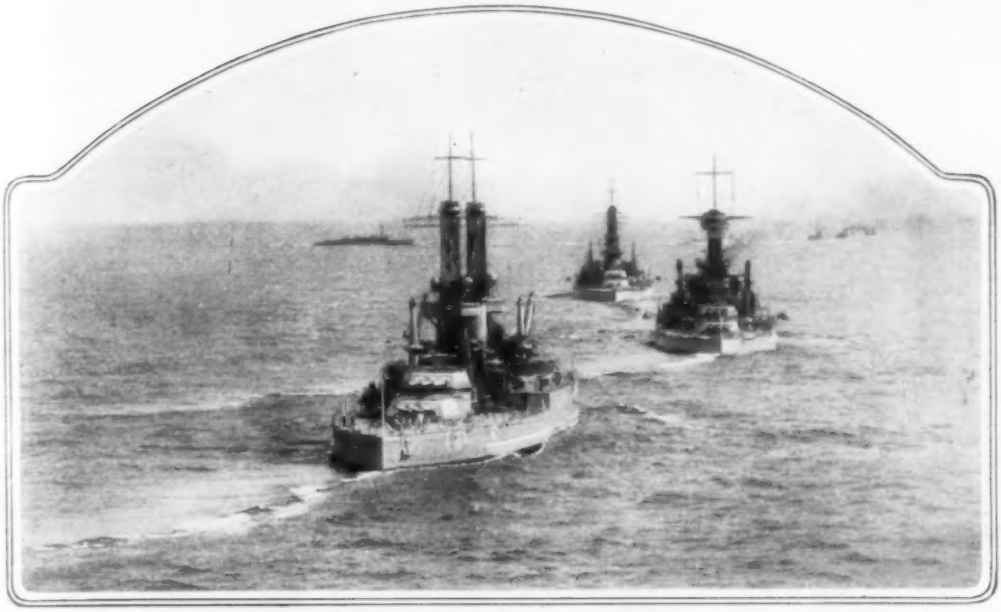
As a substitute for rubber-tired casters used on various kinds of carts, a fabric-faced wheel is now being made for which an exceptionally long life is claimed. These "tires" are constructed of many pieces of waterproofed and specially woven material, tightly pressed and stitched together. When completed, the covering is said to be almost as hard as rock but noiseless. It is placed upon the wheel by clamping it between steel parts that are riveted to the casting in which the bearing is to be bored.

President's Ink Is Held in Stand Made from Two Horseshoes

Fashioned from two steel horseshoes, a penholder and inkstand recently presented to President Coolidge, is the product of a Boise, Idaho, blacksmith's skill. A small anvil rests between the points of a large symbol of good luck and the inkwell fits into a rack that supports the ornaments. Places for pens and pencils are formed by the heads of six nails that appear to pro-

Inkstand Fashioned from Two Horseshoes by Idaho Blacksmith and Presented to President Coolidge

trude from their holes in the shoe. A neatly engraved inscription bears the names of the executive and the giver.



One of Uncle Sam's Fighting Fleets in Peace-Time Maneuvers off the Coast of Panama; the Ships "New Mexico," "Tennessee" and "Idaho," Moving into Line for Battle Formation

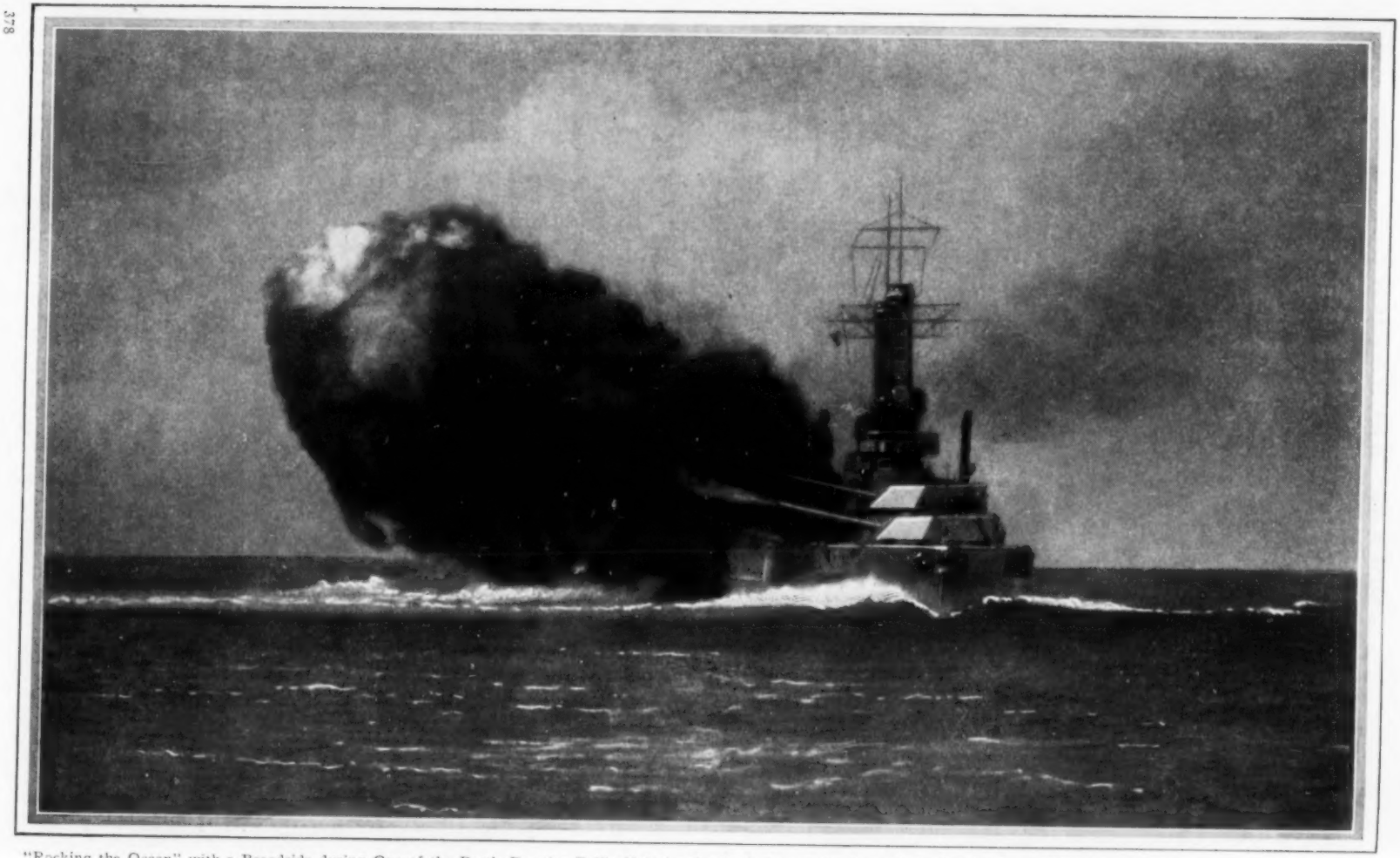
With the Navy in Peace Times

Battle Practice and Maneuvers Keep Fighting Ships at Highest Degree of Efficiency

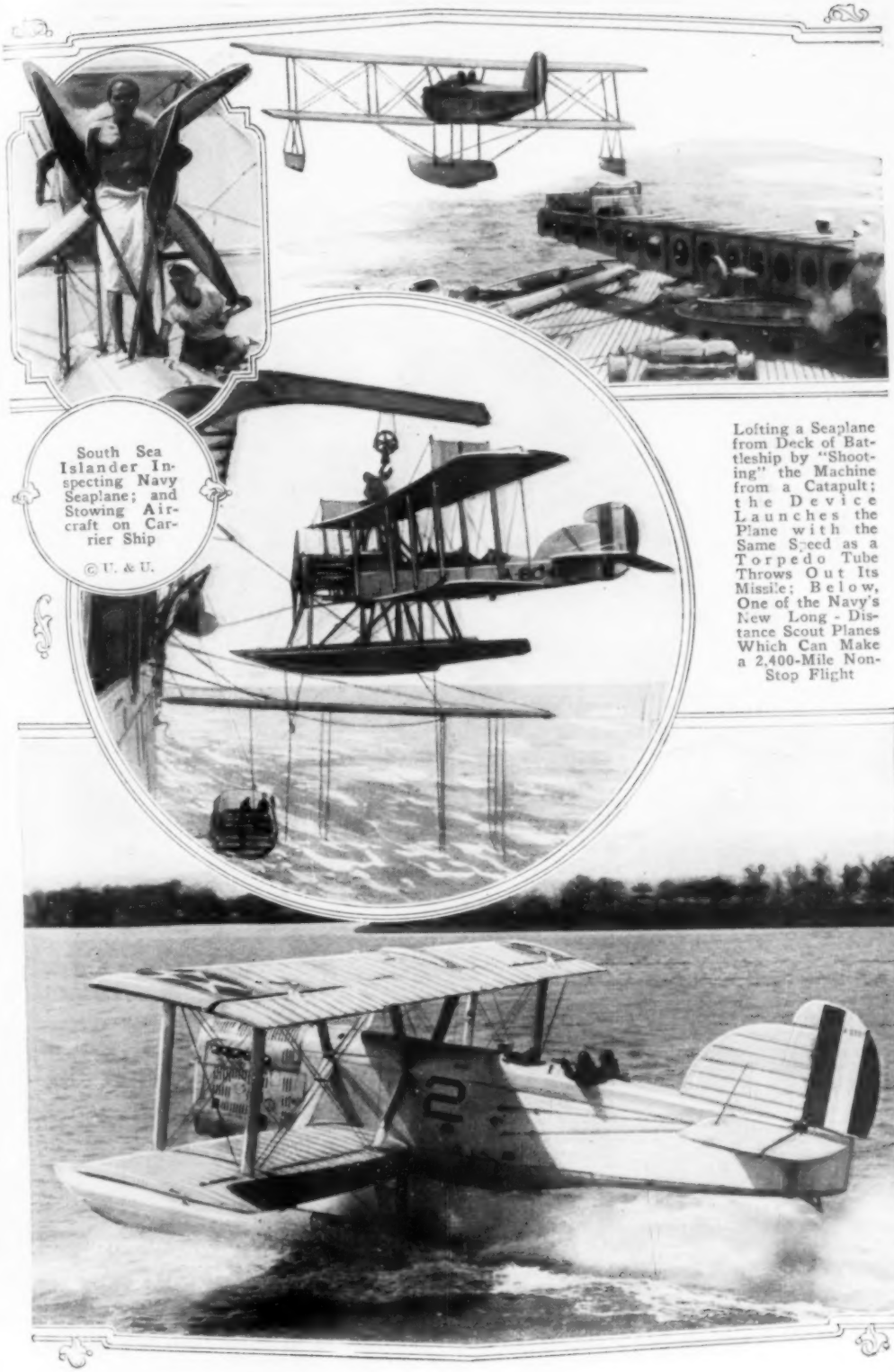
OVER a dark sea canopied by a night sky sprinkled with stars, two lines of swift warships, portlights gleaming, lifting and falling, drive through the swell toward the Vieques area of the Caribbean sea for battle practice. On their arrival the sober work of war begins. All day long the ships steam past targets which are towed behind tugs. Decks are cleared for action and all forces are engaged, including the aircraft and the carrier ships.

In the lower handling rooms, narrow steel-locked coffins below the turrets, sweating men haul out the great shells and the powder charges and speed them upward on the hoists to feed the guns above. In the turrets, men shoot the shells home. In "plot," a secret room in the bowels of the ship, officers, not seeing the "battle," but in constant touch by telephone with every fall of shot, chart the ranges. From the foretop, a breezy room at the top of the forward skeleton mast, observers shout information into a telephone for the men working plot. The "enemy" are on the horizon. Your ship is steaming at full speed,

Submersible's Periscope Is Withdrawn by Unseen Observer Below after Sighting Target in Distance



"Rocking the Ocean" with a Broadside during One of the Battle-Practice Drills Held by the U. S. Navy; the Roar of the Bombardment Was Heard a Hundred Miles Away as the Floating Fortresses Boomed at a Fleet of Target Rafts Which Were Splintered by the Gun Fire



South Sea Islander Inspecting Navy Seaplane; and Stowing Aircraft on Carrier Ship

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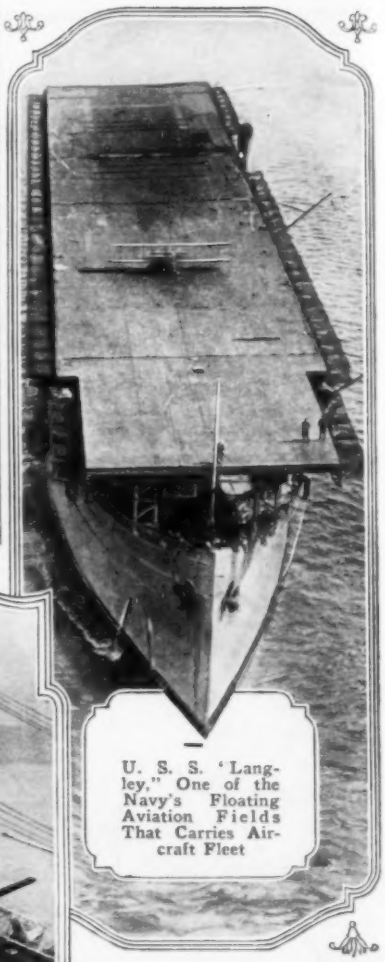
Lofting a Seaplane from Deck of Battleship by "Shooting" the Machine from a Catapult; the Device Launches the Plane with the Same Speed as a Torpedo Tube Throws Out Its Missile; Below, One of the Navy's New Long-Distance Scout Planes Which Can Make a 2,400-Mile Non-Stop Flight

"Rocking the Ocean" with a Broadside during One of the Battle-Practice Drills Held by the U. S. Navy; the Roar of the Bombardment Was Heard a Hundred Miles Away as the Floating Fortresses Boomed at a Fleet of Target Rafts Which Were Splintered by the Gun Fire

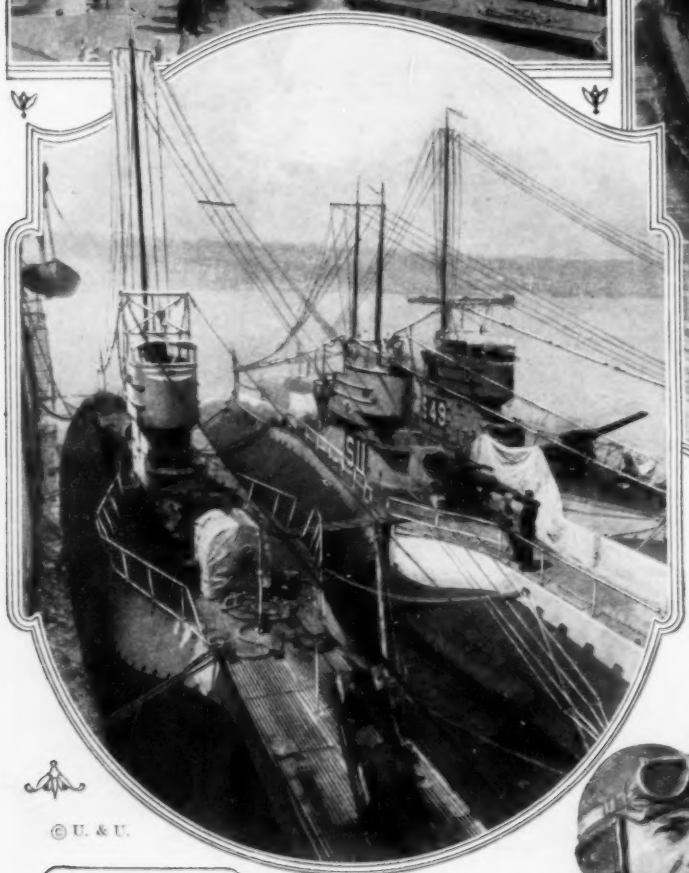
At the Height of Action during War Practice by Battle Fleets of the U. S. Navy; the Enemy Is Imitated by Barges Bearing Huge Targets Towed across the Line of Fire

All Services of the Sea-Fighting Arms Are Represented in Big Naval-Combat Drills, and Aircraft and Submarines Join Forces with the Thundering Armadas of Warships

Sailors Inspecting New High - Powered Seaplane with Which Their Ship Is Equipped



U. S. S. 'Langley," One of the Navy's Floating Aviation Fields That Carries Aircraft Fleet



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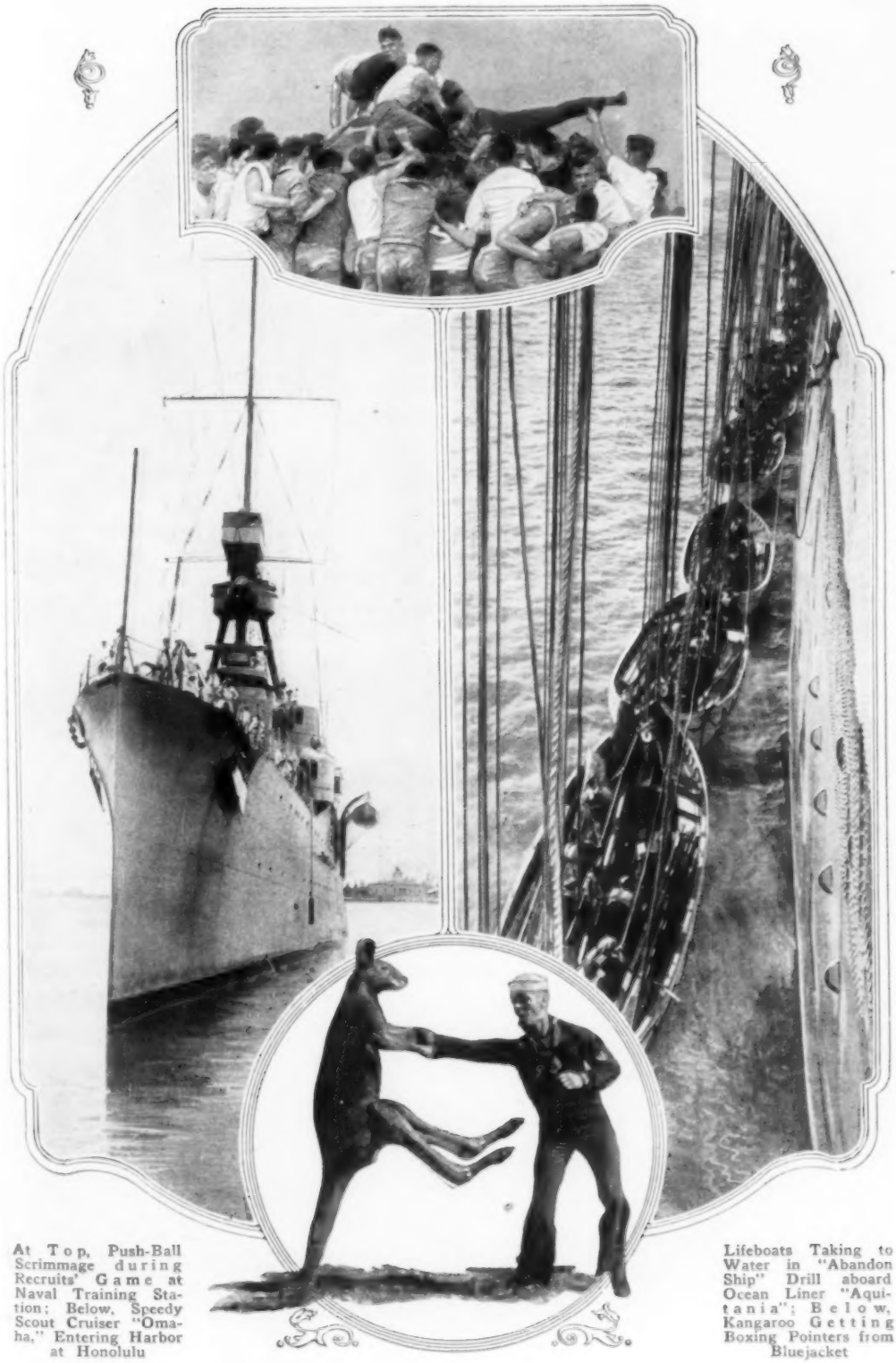
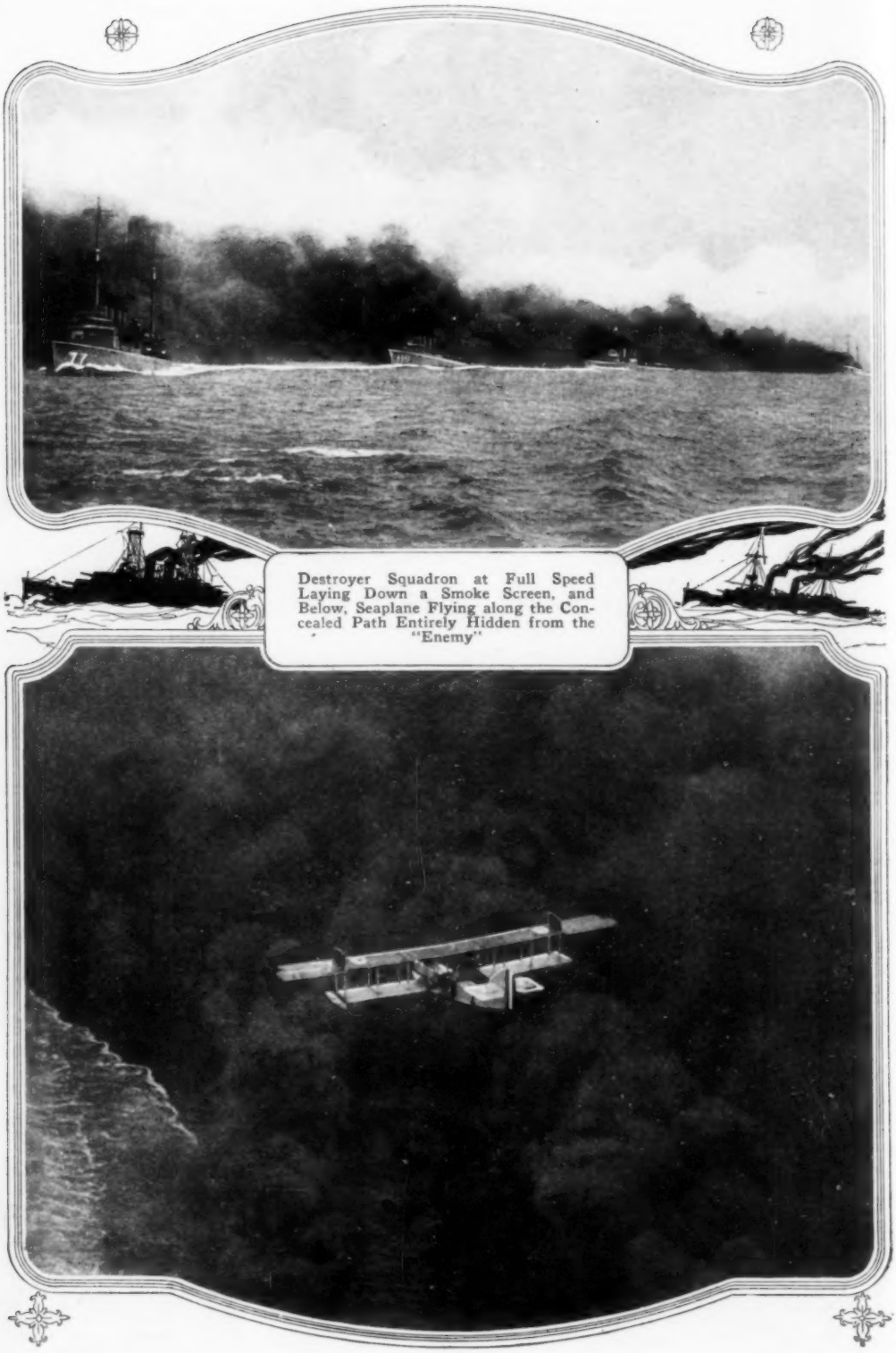
Submarines of Latest S-Boat Type Tied Up after Long Trip; Right, Lieut.-Comm. Davis, Senior Flight Surgeon of Naval Air Force



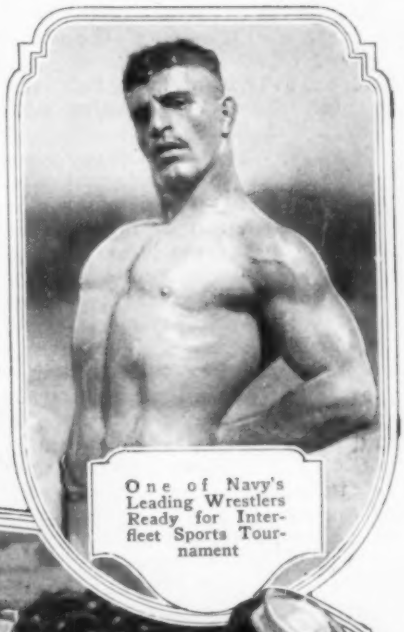
At Top, Push-Ball Scrimmage during Recruits' Game at Naval Training Station; Below, Speedy Scout Cruiser "Omaha," Entering Harbor at Honolulu

Lifeboats Taking to Water in "Abandon Ship" Drill aboard Ocean Liner "Aquitania"; Below, Kangaroo Getting Boxing Pointers from Bluejacket

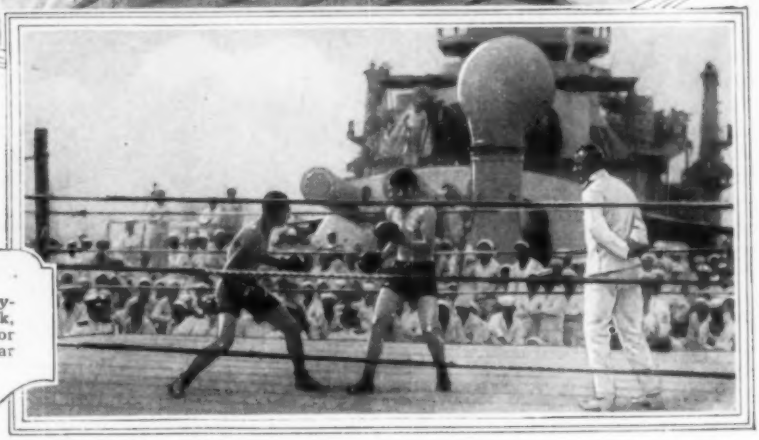


Destroyer Squadron at Full Speed Laying Down a Smoke Screen, and Below, Seaplane Flying along the Concealed Path Entirely Hidden from the "Enemy"

Sight-Seeing "Bus" in Somaliland, Where Sea Fighters Landed during a Cruise



One of Navy's Leading Wrestlers Ready for Interfleet Sports Tournament



"Gobs" off Duty, Playing Maj Jangg on Deck, and Boxing Bout for Championship of War Vessel

dodging hypothetical submarines. There is not a soul moving on the maplike decks below, but the thin noses of the guns move slowly to and fro, keeping "on" the target. Then comes the swift order. There is a flare of fire. Simultaneously the mighty ship is slammed back, shuddering from the recoil, quivering as if it had hit a mountain side. Gray-black smoke and a thundering roar follow the flare. A broadside is exciting.

There, three-quarters of the way across the span of water are two great, black birds, apparently, flying low and almost slowly, side by side. They are the shells, so large and heavy that their relatively slow flight is visible. You watch them, fascinated, as they rip through the target and plunge into the sea beyond. A great white shaft of spray lifts into the air from the turbulent water. It is like the blow of a mammoth whale. It falls and the ocean is silent. Another hit has been scored. That is battle practice, but it is only a small part of the work of the American navy in peace times. In the Yangtze river, naval gunboats protect American interests from river pirates. In Central America, special-service cruisers watch over our extensive fruit interests. In Turkish waters, destroyers insure the movement of American oils. Other naval craft are disposed throughout the world, in Asia, in the South China patrol, the destroyer squadron at Manila, the submarine divisions also at Manila, the destroyer detachment in European waters, the special-service squadron operating in the Caribbean and South America, and a fleet of fifteen large liners constantly employed in naval transportation. This entire force, comprising hundreds of vessels, is organized under a single battle command, and is so moved by the office of naval operations that at least once a year it operates as a unit for three or four months, and is at all times ready for immediate junction. No fleet movement is made which could conceivably prevent a quick and efficient rendezvous in the event of an emergency arising. But, in addition to being a first-class insurance, the navy has been called the nation's greatest university, because of the numbers of men it trains, and the largest scientific laboratory, as a result of the encouragement it gives to manufacturers. Andrew Carnegie once declared that the steel industry was built on naval specifications; that its demands for perfection enabled the industry to evolve the higher grade steels now in general use today. Strange as it may seem, the electric light also might have been impossible had not naval scientists, in support of Thomas A. Edison, demanded that the navy purchase the early lamps and assist in their development. Recently, a marvelous advance has been announced in the tool industry—a metal known as "monel" has been discovered, which is sweeping the mechanical trades. This industry, too, was first subsidized by naval authorities who recog-

Fighting Crew of Warship at Gun Drill with a Five-Inch Naval Rifle; Almost a Daily Duty of the Vigorous "Tars" Charged with Handling the Piece during a Battle

Thirty Tons of Anchors That Grip the Ocean Floor to Hold a Giant Battleship in Leash, and a Closeup of a Propeller Just Before It Is Scraped Clean in Drydock by a Crew of Sailors

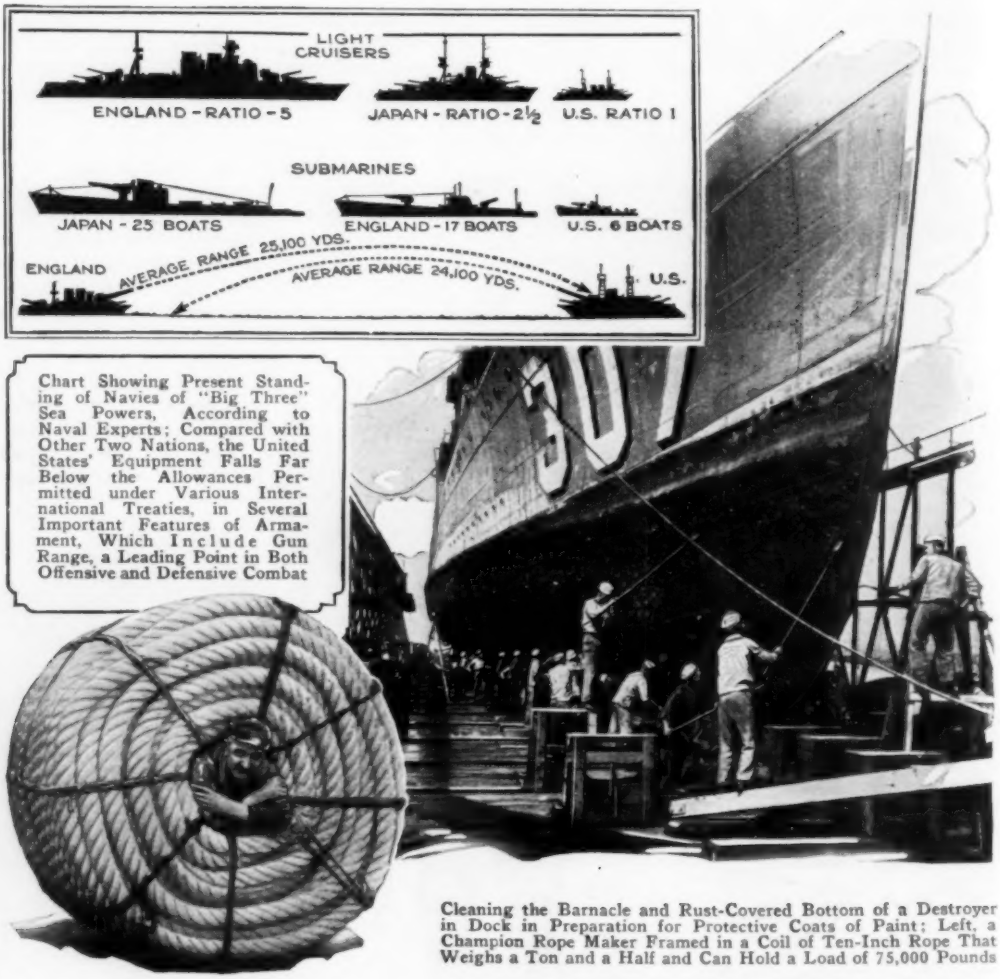
nized its value, and the monel-metal industry, now so important in American tool manufacture, was placed on its feet.

With the advent of radiotelegraphy and telephony, the naval technicians rapidly began to set the standards in these arts, and today navy radio and its rules and regulations dominate the wireless of the country. The naval radio-communication service now includes more than 1,000 land and ship stations in every part of the world. Regular overseas schedules between San Francisco, San Diego and Honolulu and the Canal Zone, between Washington and European stations and South American stations, between Manila and Honolulu and our legation at Pekin, between Alaska and Hawaii and the United States mainland, wherever the flag flies, are maintained. Not only does the navy maintain a first-class advanced radio school, but the pathway to commissions for enlisted men is an ever-beckoning light, in addition to the post-graduate courses in radio engineering which graduates of the naval academy may secure.

To date, more than 500 naval aviators have given their lives in planes and airships in the cause of aviation. The naval air service comprises a military body of men who are at all times available for the testing of new advances in aircraft. Oftentimes they sacrifice their lives, but they believe their country engages them for the risks they assume—and so the danger is accepted as a routine matter. For instance, there was the recent death of Lieut. Lambert Hewitt, test pilot for the aircraft squadrons of the battle fleet, who lost his life last autumn while testing a new camber wing, invented by an enlisted man. The camber wing has since been demonstrated to be worthy of adoption; but that particular day it was not complete in its safety element—and Hewitt, engaged in flying the test, crashed to earth and was killed.

The naval observatory at Washington, D. C., is the country's standard time-setting center, and the naval hydrographic office is the standard mariners' bureau of the United States, and charts are sold by it to all ships afloat. Two destroyers, the "Hull" and the "Corry," are now in

Chart Showing Present Standing of Navies of "Big Three" Sea Powers, According to Naval Experts; Compared with Other Two Nations, the United States' Equipment Falls Far Below the Allowances Permitted under Various International Treaties, in Several Important Features of Armament, Which Include Gun Range, a Leading Point in Both Offensive and Defensive Combat



Cleaning the Barnacle and Rust-Covered Bottom of a Destroyer in Dock in Preparation for Protective Coats of Paint; Left, a Champion Rope Maker Framed in a Coil of Ten-Inch Rope That Weighs a Ton and a Half and Can Hold a Load of 75,000 Pounds

Alaskan waters sounding every inch of the coast, and perfecting charts which will benefit all ships which navigate those waters. But perhaps the most vital of all the naval functions is the annual pouring into American industry and science, of several thousand trained young men who are skilled in every conceivable branch of industry, from excellent opticians, pharmacists and radiomen, to coppersmiths, blacksmiths and sheet-metal workers. An estimate made recently, based on actual examination of records, shows that eleven per cent of all pharmacists in the United States are ex-naval personnel. Also three-fourths of all commercial radio operators and superintendents are men with naval experience. Recently, the photograph of the apprentice class aboard a United States naval ship in 1895 was checked, and it was found that out of the twenty-two men shown, two are mayors of cities, four are prosperous lawyers, one owns a flourishing department store, seven are engaged in successful mercantile enterprises, one is a farmer of means and one is a leading American magazine artist. Of the remaining six—less than one-third of the class—no trace could be found.

Graduates of the naval academy equipped with special technical knowledge have passed into civil life and made national names for themselves. Among these may be mentioned Homer L. Ferguson, president of the Newport News Shipbuilding company; the present secretary of the navy, who was chief justice of the state of California; Joseph Powell, recently head of the Bethlehem shipbuilding plants; W. L. R. Emmett, consulting engineer, General Electric company, and designer of electric ship propulsion, and Professor Michelson, of Chicago University, one of the greatest living scientists.

Eight Men Rebuild Railroad Box Car in Six and One-Half Hours

Rebuilding a double-sheathed freight car of 60,000 pounds' capacity in six and one-half hours was the accomplishment of a picked crew of eight men in a three-team contest conducted by officials of the Delaware and Hudson railroad. The feat is said to establish a record in car construction. The task involved completion of the entire superstructure, installing the gears and couplers and assembling the car on the track. To speed the work, parts were piled in convenient positions and in the order that they would be needed. Pins, bolts and nuts were sorted by sizes. The purpose of the competition was not to establish a speed record but to demonstrate efficiency and timesaving methods.

Garage Doors That Roll Overhead Save Space and Repair Bills

Garage, factory and warehouse doors that roll up overhead are being manufactured to replace the ordinary hinged or sliding door. They are constructed in panels, somewhat like the roll top of an office desk, and slide on flanged rollers and steel tracks. When the door is opened, it is inside where it cannot be damaged by the weather and cannot blow shut. It is counterbalanced by strong steel springs, locks automatically when closed, fits flush with the floor and is not hard to install. As it

Sliding Garage Door Overhead, Where It Cannot Slam Shut or Protrude on Sides

does not project beyond the building, it is convenient where the garage or other structure is erected in limited space.

Camp-Fire Meals Are Cooked Easily on Revolving Bracket Grid

Much of the unpleasantness of cooking over the camp fire may be eliminated by the use of a revolving bracket grid recently

Sketch of Camp-Fire Cooker; Pots Are within Easy Reach on Grid Frame That Revolves

invented. It consists of a short, pointed base which is driven into the ground and about which the fire is built, an extension tube, a revolving top piece and four interchangeable grids. Several things may be cooked at once, and a light touch is sufficient to swing the arrangement around for stirring the contents of a pot or for placing anything over the hottest part of the fire without stepping into the smoke. The entire outfit is quickly assembled or taken apart, occupies but little space and is durable. The surfaces of the cooking grids are angular-shaped, making them easy to clean and well suited to broiling steak or toasting bread.

Glitter of Gold Is Found in Alloy

Resembling real gold in appearance and said to possess some of its chemical and physical properties, a composition of copper and aluminum mixed by a patented process has been invented by Swedish scientists and is now being manufactured in this country. It is not affected by the common acids and alkalis, does not turn black or corrode and is reported to be nearly as hard and durable as steel.

Push-Button Piano Cabinet Plays Program of Eight Rolls

For playing a number of piano records one after another without the bother of changing them by hand, a cabinet attachment that can be fitted to any make of player has been designed. It is electrically operated and may be placed at any distance from the playing instrument. Connection is made by an electric-pneumatic cable. The records, eight in number, are wound on separate reels within the cabinet and may be played in any order desired simply by pressing corresponding buttons in a small control box which may be placed in any convenient position and is connected to the cabinet by wires. Opposite the buttons, the names of the selections are written on a card. Any roll may be stopped at will or replayed simply by pressing the control. One side of the cabinet contains space for the library of selections. To change the program it is merely necessary to put new rolls on the reels. If desired, more than one control box may be used, so that the player may be started from various parts of the house.

Push-Button Record Selector in Use and Interior View of Playing Side of Cabinet, Showing Cable Connections and Rolls on Battery of Reels

Perfume Plant in Florida May Cut Cost of Essential Oils

Within the past year, American capital has fostered the establishment of an essential-oil plant in Florida which bids fair to reduce materially the cost of such products for the consumer. It is said to be the first of its kind to demonstrate the feasibility of such production in this country. One hundred and seventy acres of flowers are now under cultivation and an additional tract of 500 acres is being prepared. Five buildings, comprising over 27,000 square feet of floor space, have been erected for the manufacture of perfumes, toilet waters and all sorts of cosmetics. Labor-saving machinery, which is said to enable one man to duplicate the labor of seventy-two workers using the obsolete methods in vogue in the Orient, is being used; the absence of frost results in a saving of fuel and production costs are further decreased by the fact that there are vast quantities of a white clay, used

in extracting the perfume, on the tract owned by the company.

Besides the many kinds of flowers cultivated in the gardens, acres of citrus trees provide orange, lemon and other kinds of blossoms for perfume manufacture. The petals are gathered in sheets spread under the trees and are placed in air-tight glass cabinets, where they are exposed to the absorbent clay for twenty-four hours. The perfume is later extracted by treating the clay with alcohol.

Vivid Hues Brighten Paper Money to Check Counterfeiting

So that it will be harder to counterfeit United States paper currency and spurious notes may be more readily detected, legal tender is being brought out in distinctive colors. The denominational figure, serial number and treasury seal will be printed blue on silver certificates, red on United States notes, green on federal-reserve notes, brown on national-bank notes and yellow on gold certificates.

Lamp Shades Designed in Forms of Birds and Animals

Designed in the shape of birds and animals, shades for electric lights have been introduced in England, where it is said their odd appearance has resulted in a great demand for them. Painted in the natural hues of the subject, with the incandescent lamp inside, the shade presents a novel effect while softening the glare of the light. Of various models, they are used on floor lamps, ceiling and wall lights.

Painting Electric-Lamp Shade That Is Designed in the Shape of a Duck

Corn That Grows in Seventy Days Is Tested by Uncle Sam

Revolutionary experiments in corn are in progress at the department of agriculture following the discovery of a number

Some of the Species of Corn Tested in Effort to Obtain More Hardy Varieties

of new varieties in the Andean highlands of South America. One kind, with stalks so short that the ears appear to grow directly out of the ground and which matures in seventy days, is being tested. It is planned to breed this with several other foreign species in an effort to obtain a cereal that will thrive in much colder areas than the present corn belt in the United States. The South American product grows in a climate twenty degrees colder.

Junk Thirty-Five Hundred Miles of Railway in Eight Years

Within the last eight years, 3,500 miles of railways have been abandoned in the United States, according to statistics. Reports to the interstate commerce commission show that between 1916 and 1921 there were increases in mileage in only sixteen states and reductions in thirty-one. The states in which more than 100 miles of track were abandoned include Louisiana, 483 miles; Colorado, 423; Michigan, 275; Indiana, 270; Georgia, 242; Arkansas, 235; Washington, 201; Missouri, 195; Wisconsin, 192; Pennsylvania, 187; Mississippi, 165; Nevada, 157; Ohio, 150; North Carolina, 149; Alabama, 145; Minnesota, 143; California, 134; Virginia, 131; New York, 109, and Iowa, 103.

Lifelike Group of Manikins Gowned in Fashions Conforming with Those in Vogue during Various Periods of Nineteenth Century; at Left, the Modeler Who Designed and Arranged the Display

Thousand Years of Fashions Shown by Dolls

Styles in Women's Dress for Past Ten Centuries Depicted in Group of Clay Manikins for Exposition

WOMEN'S fashions for the past ten centuries, worn by a hundred tiny clay models, each formed to represent some prominent woman of the times represented by its dress, have been arranged in an interesting exhibit designed for display at the Philadelphia exposition in 1926. Each of the dolls is an exact counterpart of the human figure and about eighteen inches in height. The garments with which they are dressed are not only faithful copies of the styles of former periods but are also made of the same materials as were then in use among popular seamstresses.

Five years were consumed by the molder of the figures in searching old books and manuscripts for proper descriptions of the costumes of the various periods. Nothing was overlooked in the hunt for information, as styles covering bonnets, hairdresses, shoes, stockings and even parasols had to be copied faithfully to perfect every detail of the work. The dressing and making of the models, after all research work was completed, required a little more than a year. A colored plate drawn to size was made for each figure, and tissue-paper patterns were cut for each dress and gown, so that similar tiny garments may be made in the future for other manikins of the same size, should the artist desire them.

The heads of the dolls are crowned with daintily made wigs formed from human hair and dressed to meet the style corresponding to the costumes. Besides the gowns that drape the manikins, each is robed with undergarments and other accessories of dress in vogue during the period it indicates. Ornaments for trimming the clothing and tiny bits of "jewelry" shaped from colored glass serve to enrich the effect of the individual displays.

The faces of the figures are carefully painted and each subject is made to look like some notable woman of the time and country represented by the garment.

All of the research work, designing, painting and arrangement of the group for exhibition was done by Mrs. Agnes Ericson of Berkeley, Calif., for her own entertainment and pastime. The styles of the clothing and other articles of dress as well as the portraits from which the faces of the figures were copied, were obtained by the artist in the library of a university. Another set of similar models is now being planned by the maker, who expects to include fashions as far back as the ninth century. In this collection the styles of both men and women of the various periods will be portrayed. The new group will consist of more than a hundred small characters modeled after those seen in familiar historical illustrations of the past. It is believed that at least five years will be necessary to perform all the work required to produce a perfect exhibit, as all of the tiny boots, shoes, hats, swords and scabbards will have to be made by hand, in addition to minute copies of gems and other ornaments with which the figures are to be decked.

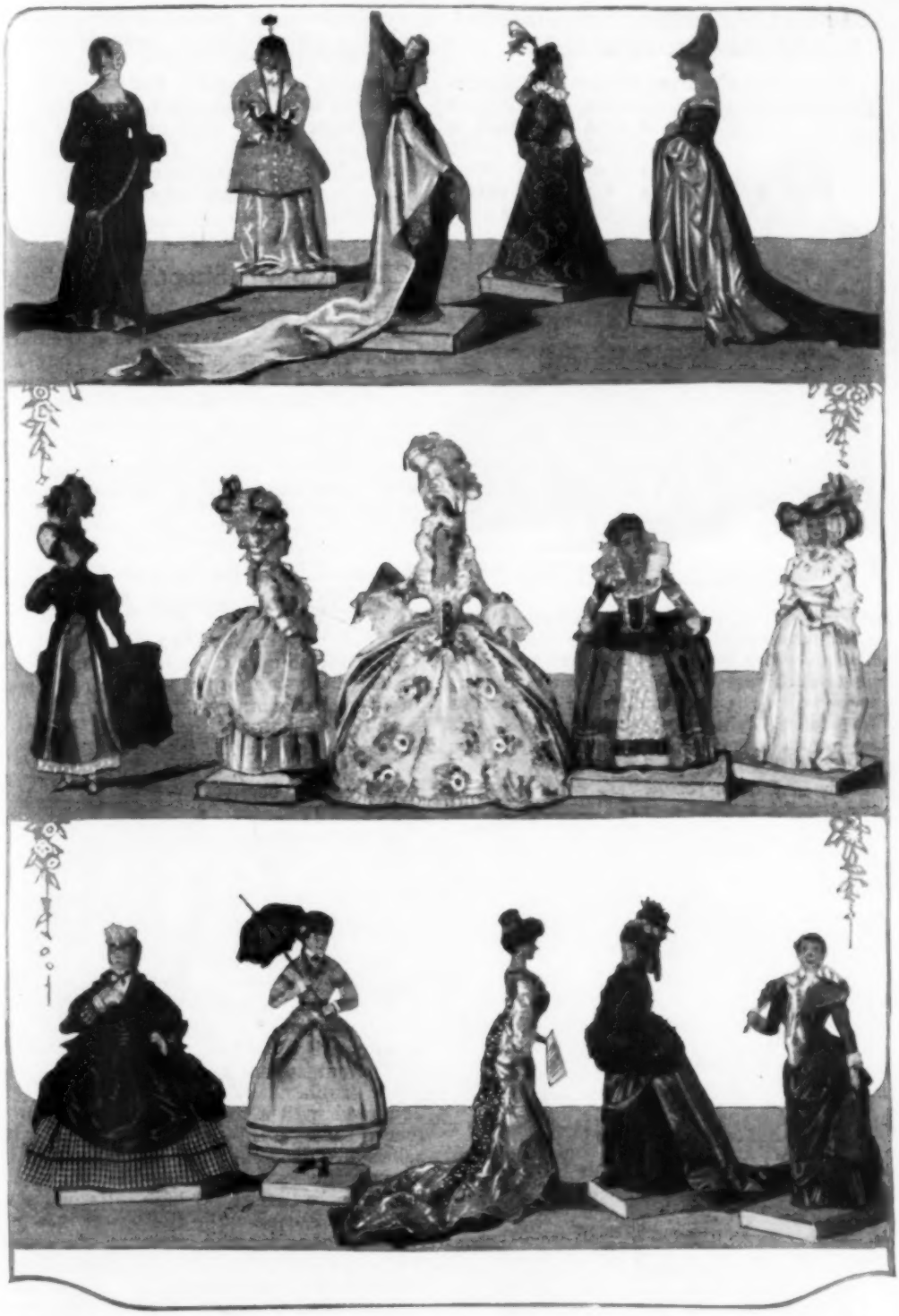
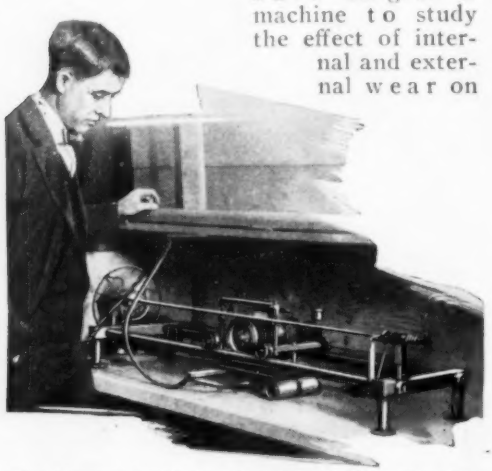


Exhibit of Carefully Clothed Clay Models of Notable Women of History Robed in Costumes of Their Times to Illustrate the Progress of Feminine Styles during Past Thousand Years

Elevator Passengers Are Protected by the Testing of Cable

To protect the lives of elevator passengers, engineers in the bureau of standards have designed a machine to study the effect of internal and external wear on



How Elevator Cable Is Being Tested by Uncle Sam, to Protect Passengers

the strands of the steel cable before it is put into service. For the latter test, an individual wire is placed between two supports with just enough tension to keep it straight. It is then subjected to friction from a revolving wheel which touches it on one side and travels on a small motor carriage from one end of the wire to the other. At each round trip of the wheel, the wire is turned a small fraction of its circumference so that the wear will be uniform.

Illuminated Ads on Motor Trucks Attract Attention at Night

Automobile trucks carrying illuminated advertising signs have made their appearance in London. The sides of the trucks are divided into frames, behind each of which a set of rollers is mounted containing forty different posters. The lighting apparatus is fitted inside the cars, and as it does not take much space, the trucks can carry merchandise, thus making the enterprise self-supporting. The current is generated by a dynamo driven by the motor. The ads are changed automatically as the machine is driven.

Automobile Truck with Illuminated Advertising Signs That Change Automaticaliy as Machine Is Driven

Three Comets Shooting at World

Three comets are due to approach near the earth in 1924, astronomers at the naval observatory have announced. They are the Encke and Temple, which will appear in November, and the Tuttle, coming in December. Special preparations are to be made to study them, it is said, as scientists have no means of determining what may have happened to them since they passed out of sight.

Rubber-Lined Barrel for Chemicals Is Proof against Acids

Lined with rubber, an oak barrel designed for shipping liquids, chemicals and acids which cannot be satisfactorily sent in metal drums, carboys or the ordinary unlined wood containers, has recently been developed. Of high-grade oak, the barrel is equipped with either six or eight hoops, depending upon the weight of the material to be carried. Into it, at the time it is made, is fitted a corrugated paper lining next to the wood, to prevent splinters from puncturing the sheet rubber. The rubber lining is equipped with a molded neck which protrudes through a bunghole. The bung itself is also of rubber and is wedged tightly against the rubber neck by a steel plate. Three corks that go through the wood permit air to escape while the barrel is being filled. To empty the contents, the corks are pulled out, the bung plate taken off and the rubber stopper removed. The barrel may be filled completely, as, it is claimed, its construction allows for considerable expansion of the contents.

Land Lighthouses Warn Motorists of Dangers and Bad Roads

Experiments in building lighthouses on land to warn motorists and other land travelers of dangerous places such as curves, cross roads and rough thoroughfares, are said to have been so successful that in Australia their construction has been made part of the highway-system program. In a small way the oscillating lights used at busy paved street intersections in American cities have been classified as lighthouses of that type.

Colored Flood Lights on Building Add to Its Beauty at Night

Bathed in a flood of colors, a Chicago building is nightly illuminated by a battery of projectors hidden from view on the structure. From a balcony on the second floor, a deep blue creeps upward along the entire 540-foot length of the building, fading slowly through violet, purple, magenta and orange into red at the cornice. A strip of amber light that produces a golden glow along the top, and a clear white light reflected against reliefs, add beauty to the scene. By connecting the projectors to a flasher, a fascinating effect has been produced, one color predominating for a few moments before blending into the next. The building is believed to be the first to be permanently illuminated in this manner.

Ice-Cream Vender on Motorcycle Moves His "Store" Easily

So that he could transport his wares cheaply and quickly to fairs, celebrations and other places where crowds gather, a

Copyright, Underwood & Underwood

French Vender Selling Ice Cream from "Store" Mounted on Motorcycle Sidecar Chassis

French ice-cream vender built his "store" on the frame of a motorcycle sidecar. Space for three large freezers is provided in the body, while the cones and utensils are stored in an inside cabinet. Covered with a canopy and gaudily decorated, the novel "shop on wheels" enables the owner to go to his customers instead of waiting for them to come to him.

Building Front Illuminated by Floods of Variously Colored Lights Hidden under Powerful Reflectors; Shades Change Regularly Every Few Minutes, Bathing the Walls in Different Hues

Lone Chimney Sweep Still Plies Trade in Tall Hat

While modern methods and new types of buildings in America have caused the once familiar chimney sweeps to seek

Chimney Sweeper in Unique Outfit with Which He Goes About His Sooty Job

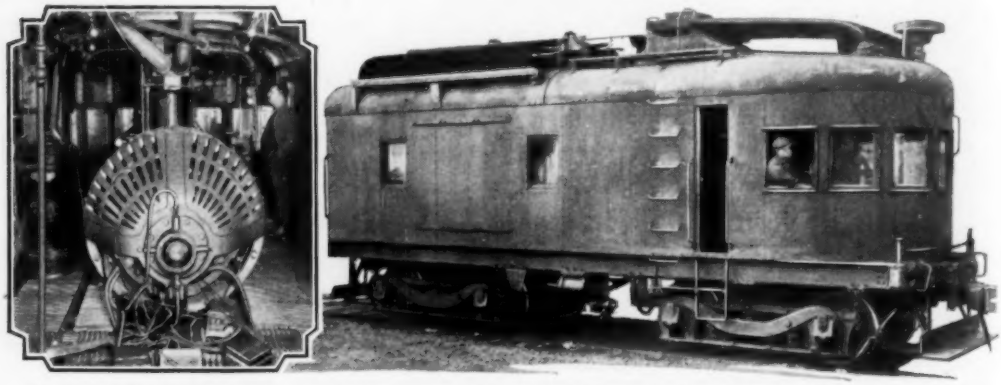
other occupations, there is one in New York who still goes about in the high hat and with the ladder that once marked his calling. Small chimneys he cleans by lowering his brush, but the large ones he lowers himself into and cleans by hand. Attached at one end to a rope and to a heavy ball at the other, the brush is pulled up and down, the heavy bristles rubbing against the sides of the stack and knocking the soot to the bottom.

Magic of Artificial Cold Touches More Than Hundred Industries

Almost everything eaten and worn is now affected by artificial refrigeration. Besides the foods kept fresh by this means, medicines, motion-picture films, furs, watch springs, seeds for the garden and silk are commonly subjected to cold to keep them in good condition. It is estimated that there are more than one hundred industries that now depend more or less upon cold storage in their business. Its application to ventilation of hotels, theaters and other buildings is rapidly increasing. Millions of cubic feet in huge warehouses throughout the country are devoted to cold-storage purposes and thousands of workers are employed.

Electric Switch Engine Cuts Cost and Does Away with Smoke

Driven by four fifty-horsepower motors with electricity generated by an oil-burning engine, the first Diesel-electric locomotive built in America was recently given a practical test in New York freight yards. The engine consumes from twenty to twenty-six cents' worth of oil an hour in switching service, which is said to be approximately one-third the cost of coal burned by an ordinary steam locomotive in similar work. A muffler reduces the noise of the exhaust, and the absence of smoke makes it particularly suitable for use in cities. An economical feature claimed for the locomotive is that, like an automobile, it is necessary to feed oil and operate the engine only when it is being run. It is said enough fuel can be carried to keep the locomotive in switching service continuously forty-eight hours.



Electric Switch Engine Which Can Be Operated at One-Third Fuel Costs of Coal-Burning Locomotives; Left, View of Interior Showing One of Fifty-Horsepower Motors

Million Words Engraved in Inch Are Invisible to Eye

For years it has been a favorite feat of engravers to write the Lord's Prayer on the head of a pin. Getting sixty-five words into that small space would seem an amazing achievement, but such an engraving is as large as a three-sheet poster compared with that done by a special reducing apparatus called a micropantograph. With this machine letters have been engraved so small that in the space of one square inch, it is said, eighty complete copies of the Bible could be written. These figures have been confirmed by tests made by the bureau of standards. It is pointed out that engravings of this kind would prove of value in war time, as messengers could carry written communications of great length on the surface of a button which it would be practically impossible for the keenest enemy officer to find a trace of unless he were an expert micrographist. The device operates like the ordinary pantograph used by artists, but is, of course, more intricate in construction. The arm which does the actual engraving contains at its end a tiny chip of diamond, selected with the greatest care. After the writing is completed, the surface is cleaned and then rubbed with a piece of soft paper containing finely powdered graphite, or, if the metal surface is dark, some other contrasting color, which fills in the lines and brings them up sharp and clear under the microscope.

Wild Boar Incased in Ice

Sweeping across a road near Rochetaille, France, an avalanche recently dropped off a huge block of ice which was found to contain the body of a wild boar. It is believed that the animal had been swept up as the mass of snow, ice and rocks started on its wild career and was frozen within it.

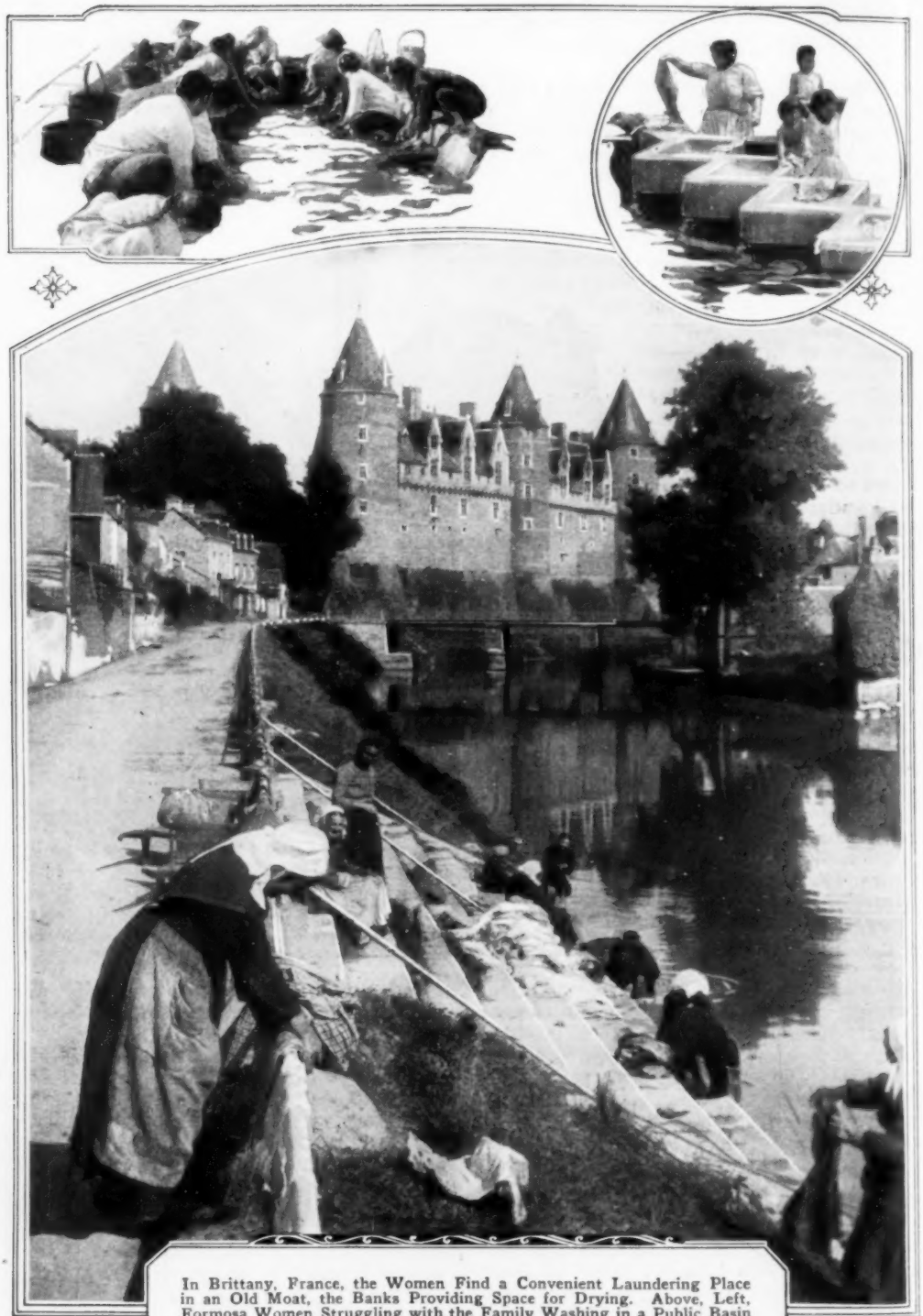
Huge Telescope to Photograph Mars Has Lens Weighing Two Tons

With Mars and the earth closer together in August than they have been for many years, special arrangements have been made by universities and at astronomical observatories to study the planet. It has also been planned to send out radio waves in an effort to communicate with the inhabitants if there are any. In many of the observatories throughout the world, telescopes have been improved and other instruments invented since the last time the two planets were as close, which was fifteen years ago.

Forty-Ton Telescope by Which Efforts Will Be Made to Get Close-Up Photograph of Planet Mars and Any Possible Evidence of Life

At the Dominion astrophysical observatory at Victoria, B. C., a giant photographing telescope, weighing forty tons, has been installed in the hope that it will be powerful enough to take pictures from which it can be determined whether or not Mars is inhabited. The lens is seventy-two inches in diameter and twelve inches thick and alone weighs 4,000 pounds. The axle on which the great tube is mounted weighs nine tons.

Washdays the World Round Show Progress



In Brittany, France, the Women Find a Convenient Laundering Place in an Old Moat, the Banks Providing Space for Drying. Above, Left, Formosa Women Struggling with the Family Washing in a Public Basin with Crude Stones; Right, Concrete Tubs Built for Public Laundering by Provident Officials of a Mexican City

Upper Photos Copyright by Burton Holmes; Lower Photo Copyright by Underwood & Underwood

# of Civilization from Days of Hand Labor

Scrubbing by Hand at Public Steps, Women in Como, Italy, Seen at Left, "Do" the Week's Washing and Dry It on Near-By Lines; Above Is a Glimpse of River Laundry in India Where Men Assist by Beating Clothing on Boards; Inset Shows a Corner of a Well-Ventilated American Laundry Where Machinery Lightens Labors

Photos Copyright by Ewing Galloway

Ancient Parent of Modern Piano Has Strings Plucked by Quills

Extremely popular in the 16th and 17th centuries, the harpsichord, the forerunner of the modern piano, has a double key-

Keyboard of the Ancient Harpsichord, the Forerunner of the Modern Piano

board but instead of the strings being struck by felt hammers, they are plucked by a piece of quill. This produces a brilliant tone and several combinations are gained with the aid of stops and the two or more strings for each note. Little expression is possible, however, because the quills do not register differences in the player's touch.

Picture Worn in Buckle of Shoe Is Latest Fad of Fashion

Buckles on women's slippers that have a space for a photograph, are among the latest fads to be introduced in Parisian shops. The frame is so made that the picture can be removed and replaced by another. Studded with jewels, the odd clasps are said to have created a sensation in the French capital.

Electricity for City of a Million Is Carried through Subway

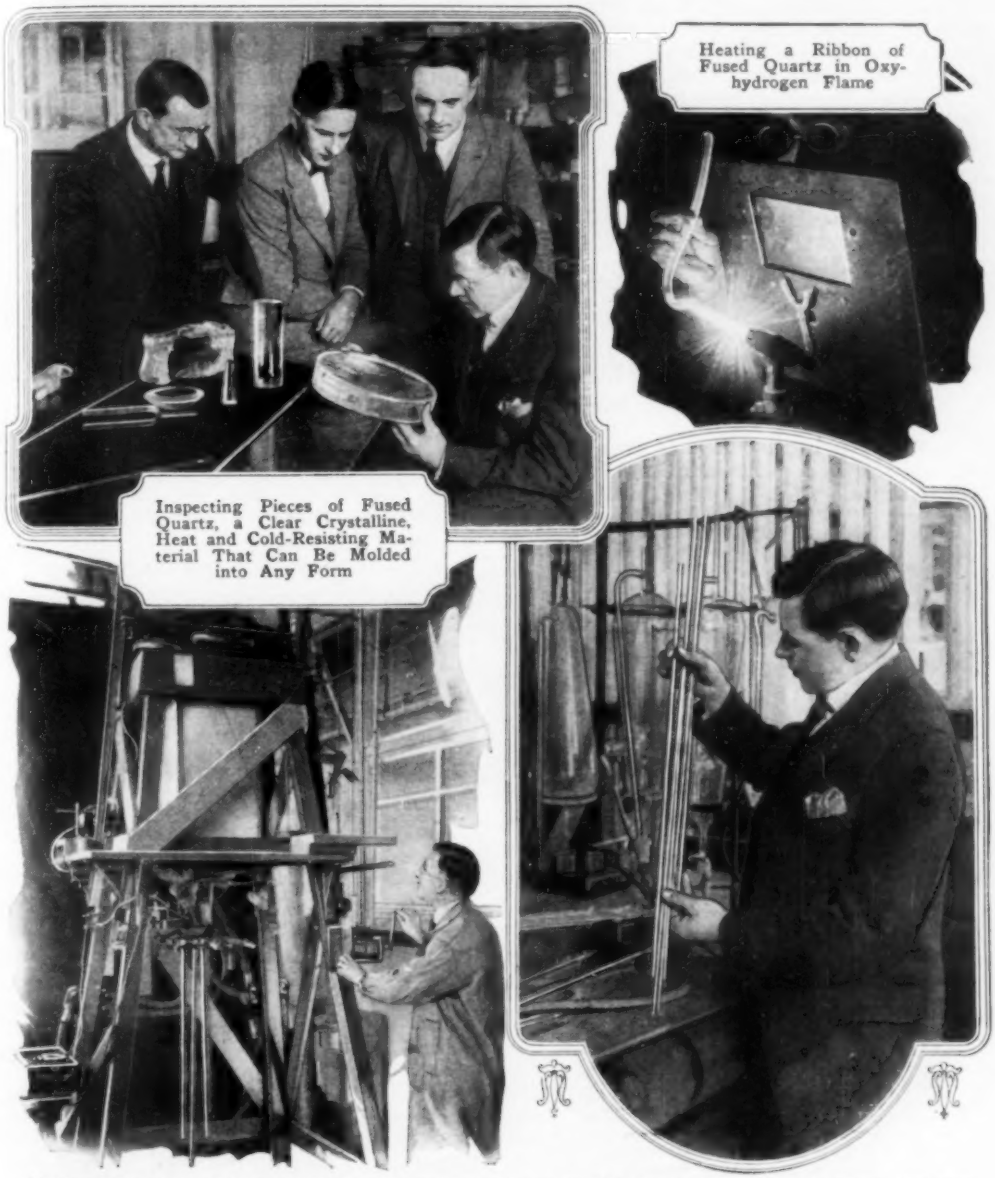
Electricity sufficient for a city of a million population is being carried through cables the size of a thumb in Cleveland. The importance of the development is said to lie in increasing the practicability of forming a nation-wide superpower system. Necessity for the construction of the cable arose from the need to supply current to interior territory of Ohio, Pennsylvania and West Virginia where water power is not available. As overhead wires were out of the question because of the danger in the thickly populated sections, a subway was dug across the city, with manholes at 300-foot intervals, to house the cables at least four and a half feet below the pavement. One cable alone carries 66,000 volts. In overhead construction, a voltage of 220,000 has been transmitted on the Pacific coast. With the success of the underground installation, it is believed that it will be possible to develop electricity at distant points, carry it hundreds of miles overhead and run it through subways for distribution in large cities.

Movie Actors' Eyes Are Protected from Lights by Helmets

To assist motion-picture actors and others employed under the strong glare of the Klieg lights used in studios, a mask that conceals the head and drapes over the body has been invented in England. While the players are not in action or are awaiting their scenes, the shield may be put on, thus decreasing the length of time they would otherwise be exposed to the rays.

Movie Worker Wearing Mask as Protection against Harmful Rays of Strong Studio Lamps

HEAT-RESISTING GLASS BENDS LIGHT RAYS



Heating a Ribbon of Fused Quartz in Oxy-hydrogen Flame

Inspecting Pieces of Fused Quartz, a Clear Crystalline, Heat and Cold-Resisting Material That Can Be Molded into Any Form

Making Rods of Fused Quartz Which Is Forced by a Heavy Weight through Shapers as It Flows Hot from Furnace, and Tubes of the Crystal Used for Experimenting with Light

By fusing quartz crystals into a clear, transparent solid, scientists at the laboratory of the General Electric company have produced a material which is expected to make possible great advances in many fields of research. It is practically unaffected by temperature and its reflectional qualities are such that light will travel down a curved rod of it and appear around the corner at the other end or even describe complete circles without the slightest radiation from the sides of the rod. Already, it has been suggested as excellent material for making astronomers' lenses which now have to be kept artificially at the temperature predicted for the night of observation and are often useless because of expansion or contraction if the pre-

dictions were wrong. Measuring instruments of far greater precision than those now in use, chemists' glass containers that will not break under extreme heat or cold are also made possible by this process, as are better lenses for motion-picture cameras since they will not crack under the great heat of the electric arc. It is also believed to be suited for tuning forks, pendulums of clocks and for the transmission of various rays now used in the treatment of diseases. The substance is prepared in an electric furnace. The crude quartz crystals are fused into clear slugs, said to be the most perfectly transparent material now known to man, under terrific pressure and forced out through molds by heavy weights. To test its qualities, a tube of it was heated to incandescence on the inside by an oxyhydrogen flame. The outside was so little affected by the heat that the experimenter easily held it in his bare fingers throughout the test. It requires an even greater heating point than platinum before it will melt, 4,000° F. being produced in the carbon crucible of the furnace in which it was manufactured. A plant is being equipped for the commercial production of this material, in the preparation of which nine years have been spent.

Rate of Tree Growth Is Measured by Instrument on Trunk

For measuring the rate of tree growth, an instrument has been invented that records the increase in the diameter of the

Instrument Attached to Pine Tree in California to Measure Its Rate of Growth

trunk. The device is placed against the tree some distance above the ground and supported by wooden blocks. It is then adjusted so that a contact point is held firmly against the bark on the opposite side. As the girth increases, pressure reveals it by the movement of a lever.

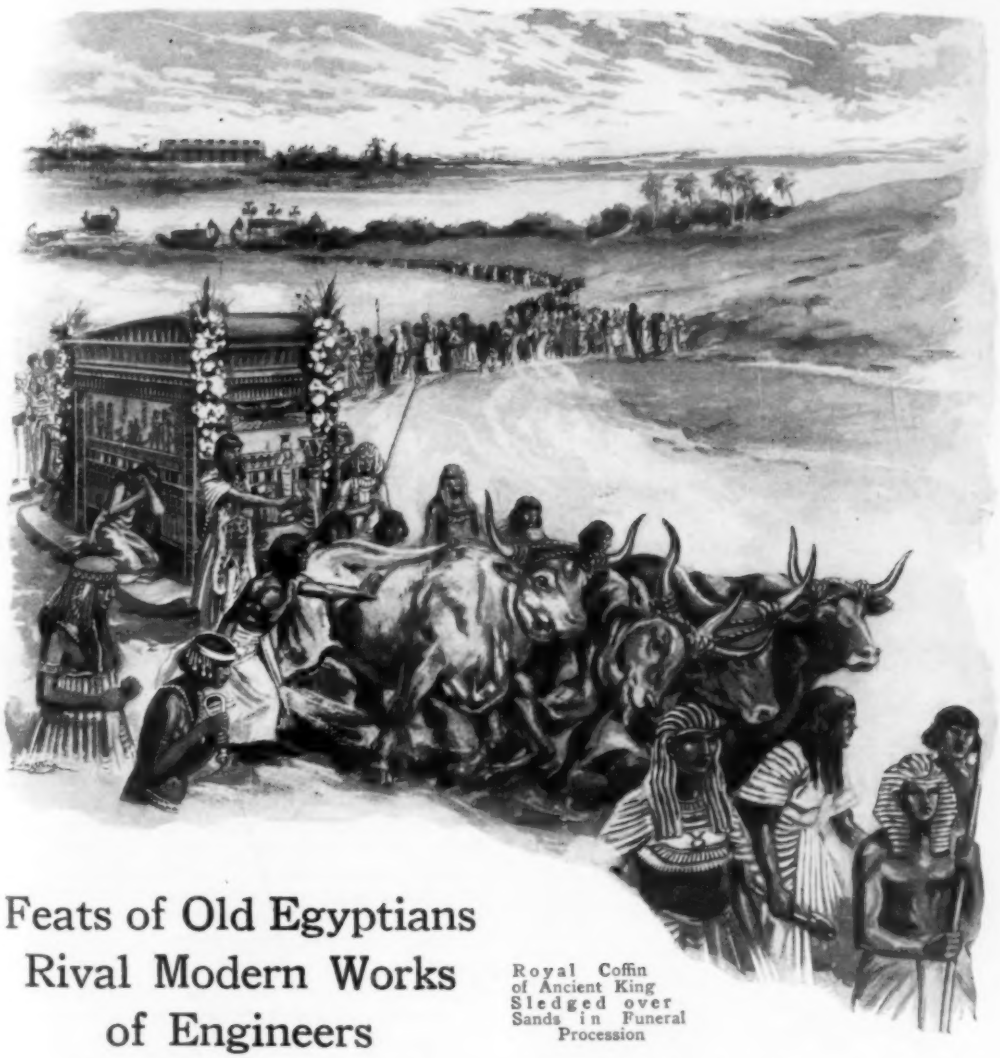
¶When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

Acres Taken from Lake Are Turned into Great Park Area

Huge quantities of the bottom of Lake Michigan are being carried thousands of feet and turned into dry land to form 11,000 acres of parks and boulevards in Chicago. Most of the transposing is being done by hydraulic dredges. A fan arrangement converts the soft bottom into a watery mixture far out in the lake. This is then pumped through thirty-six-inch pipes to the shore. From one-half to one mile has been added to the shore line for six miles. Before the summer is over, it is estimated that about 6,000,000 cubic yards of soil will have been moved.

Flexible Sandstone Is Easily Bent or Twisted Out of Shape

Rock, similar to sandstone, which can be bent or twisted when formed into thin shafts, has been found at several widely separated places. A fragment of the material, sixteen inches long and about two inches square, will vibrate like a piece of rubber when held by one end and shaken, and in some instances will sag under its own weight. The sand grains of the rock, which is supposed to exist only in the neighborhood of gold or diamond deposits, are said to be loosely locked together by their irregular shapes. Exposure to weather is claimed to cause the stone to become porous, which permits room for movement of the granules in the tiny pockets.



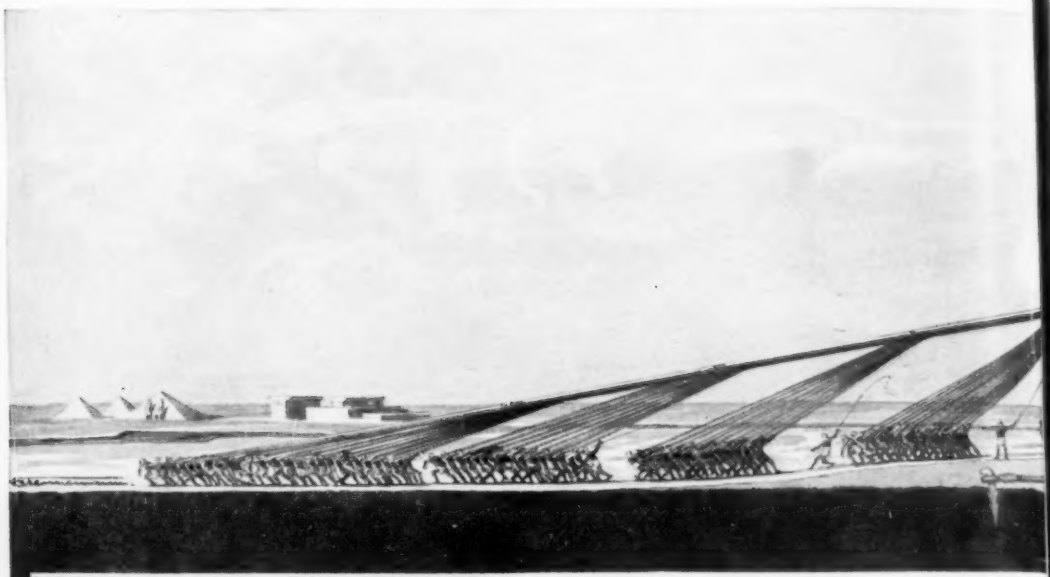
Royal Coffin of Ancient King Sledged over Sands in Funeral Procession

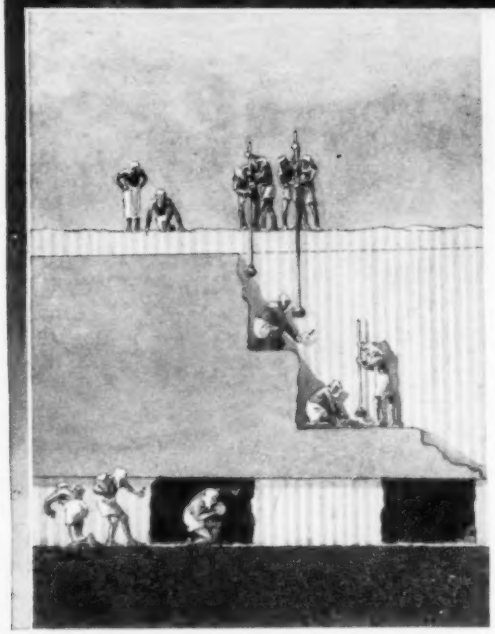
Feats of Old Egyptians Rival Modern Works of Engineers

By JAMES HENRY BREASTED
(The University of Chicago)

WE in America are quite well aware how largely the development of our country has depended upon the progress of mechanical invention and our ability to apply mechanical forces to the subjugation of a continent. Perhaps we are not so conscious of the fact that in all ages the progress of mankind has been largely conditioned by his growing ability to produce devices for the application of mechanical power to the practical problems of material life. To no small extent human history is the story of just such development, if we take into consideration also the consequences, commercial and economic, social and spiritual, which have resulted from the great mechanical conquests of past ages.

With the rise of domesticated animals and grains and the development of cattle breeding and agriculture, it was not only possible but necessary that men should live together in communities. A social instinct arose as men felt the necessity for common enterprises in which the whole community must share, like extensive defences, irrigation works, or great public monuments, buildings and memorials. Responding to requirements like this the mechanical ingenuity of early men developed far more rapidly and effectively than was ever possible in the hunting stage. The earliest communities possessed of

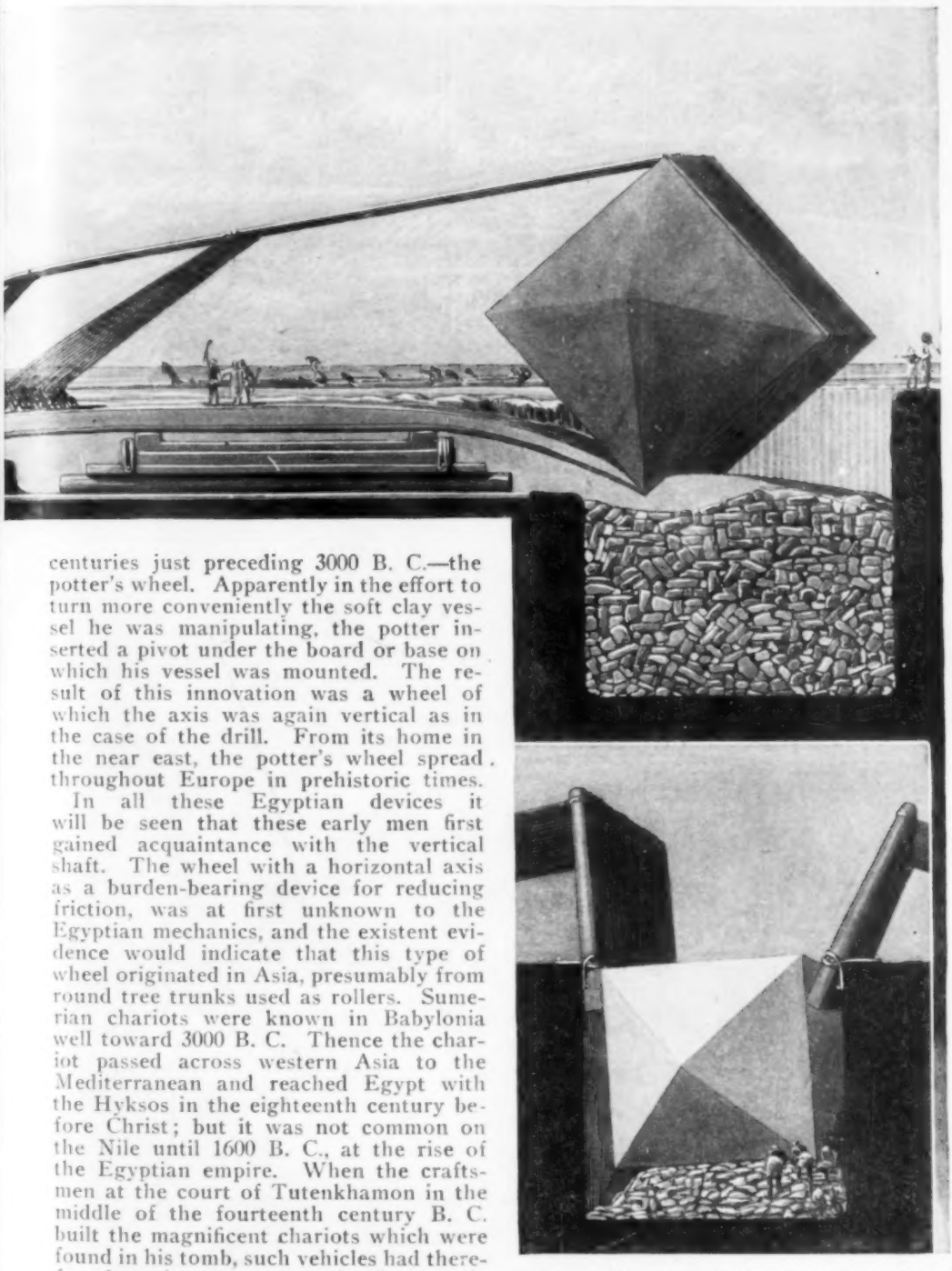




How Egyptian Engineers Rolled Great Granite Shafts from Quarries Where They Were Carved; Below, Crumbling Surrounding Rock for Removal

metal, writing, cattle breeding and agriculture that we know anything about, arose on the Nile, and there civilization first developed. In the surviving monuments and records of Egypt we can trace the development of the earliest known and simplest devices to which the name machine may properly be applied. The crankshaft of the modern automobile is lineally descended from the earliest contrivance possessing a shaft and crank ever devised by ancient men—a drill invented by Egyptian craftsmen in the centuries just before 3000 B. C., for hollowing out the interior of their superb stone vases, some of which they did not hesitate to fashion in the hardest materials like granite or diorite. This drill consisted of a vertical wooden shaft with a short crank at the top and a cutting edge of stone at the base, while two stone weights fastened just under the crank served to furnish pressure on the drill point as well as momentum, like a flywheel. This contrivance, devised over five thousand years ago, displays the earliest surviving crank and shaft, and is therefore the earliest known machine. In work requiring less weight and power and at the same time more speed, as in carpentry and joinery, or the exceedingly fine work of the lapidary in semiprecious stones, the Egyptian craftsman had already devised the bow drill. It is interesting to observe that this labor-saving device passed from Egypt to Babylonia, probably as early as 2500 B. C., and once possessed of this increased facility in cutting his hard stone cylinder seals, the Babylonian lapidary quickly lost skill and his work steadily degenerated.

The shaft, as first developed by the Egyptian in his drill, was vertical. This was true at first of all types of drill, including the hollow or tubular drill, which he invented about 3000 B. C. It was likewise true of another new machine which appeared on the Nile in the latter half of the fourth millennium B. C., that is, the

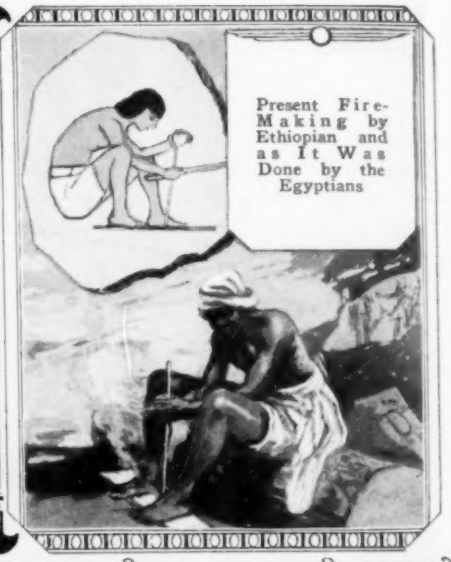


Levers to Alternately Tip Pillar to Admit Packing of Stones for Elevation from Trench

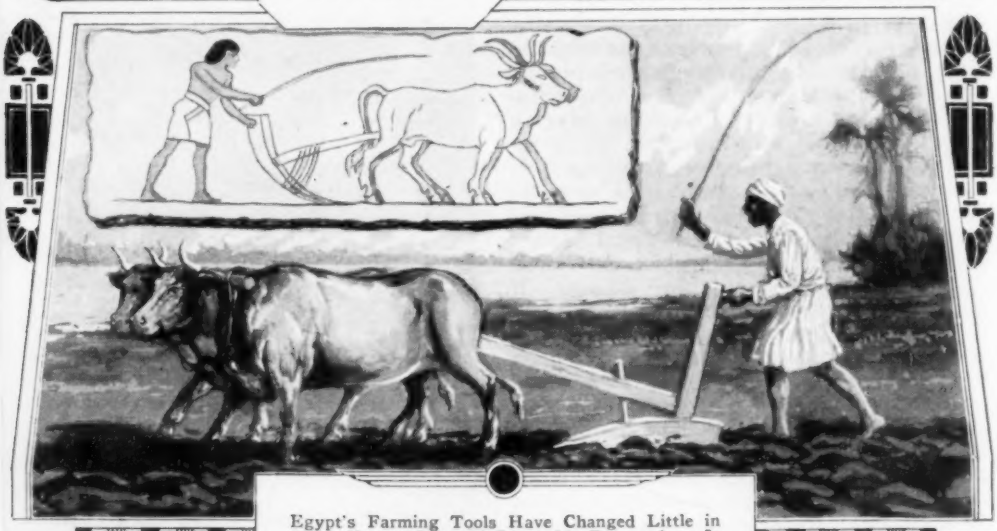
centuries just preceding 3000 B. C.—the potter's wheel. Apparently in the effort to turn more conveniently the soft clay vessel he was manipulating, the potter inserted a pivot under the board or base on which his vessel was mounted. The result of this innovation was a wheel of which the axis was again vertical as in the case of the drill. From its home in the near east, the potter's wheel spread throughout Europe in prehistoric times.

In all these Egyptian devices it will be seen that these early men first gained acquaintance with the vertical shaft. The wheel with a horizontal axis as a burden-bearing device for reducing friction, was at first unknown to the Egyptian mechanics, and the existent evidence would indicate that this type of wheel originated in Asia, presumably from round tree trunks used as rollers. Sumerian chariots were known in Babylonia well toward 3000 B. C. Thence the chariot passed across western Asia to the Mediterranean and reached Egypt with the Hyksos in the eighteenth century before Christ; but it was not common on the Nile until 1600 B. C., at the rise of the Egyptian empire. When the craftsmen at the court of Tutenkhamon in the middle of the fourteenth century B. C. built the magnificent chariots which were found in his tomb, such vehicles had therefore been in common use in Egypt only some 250 years—a matter of seven generations. There are evidences, however, that the pulley wheel, which originally was another example of the burden-bearing wheel with horizontal axis, was known to the Egyptians at an early date. A pulley

Reed Boats of Modern Nubians Similar to Those of Ancient Egypt as Shown by Hunting Scene on Old Tomb Wall



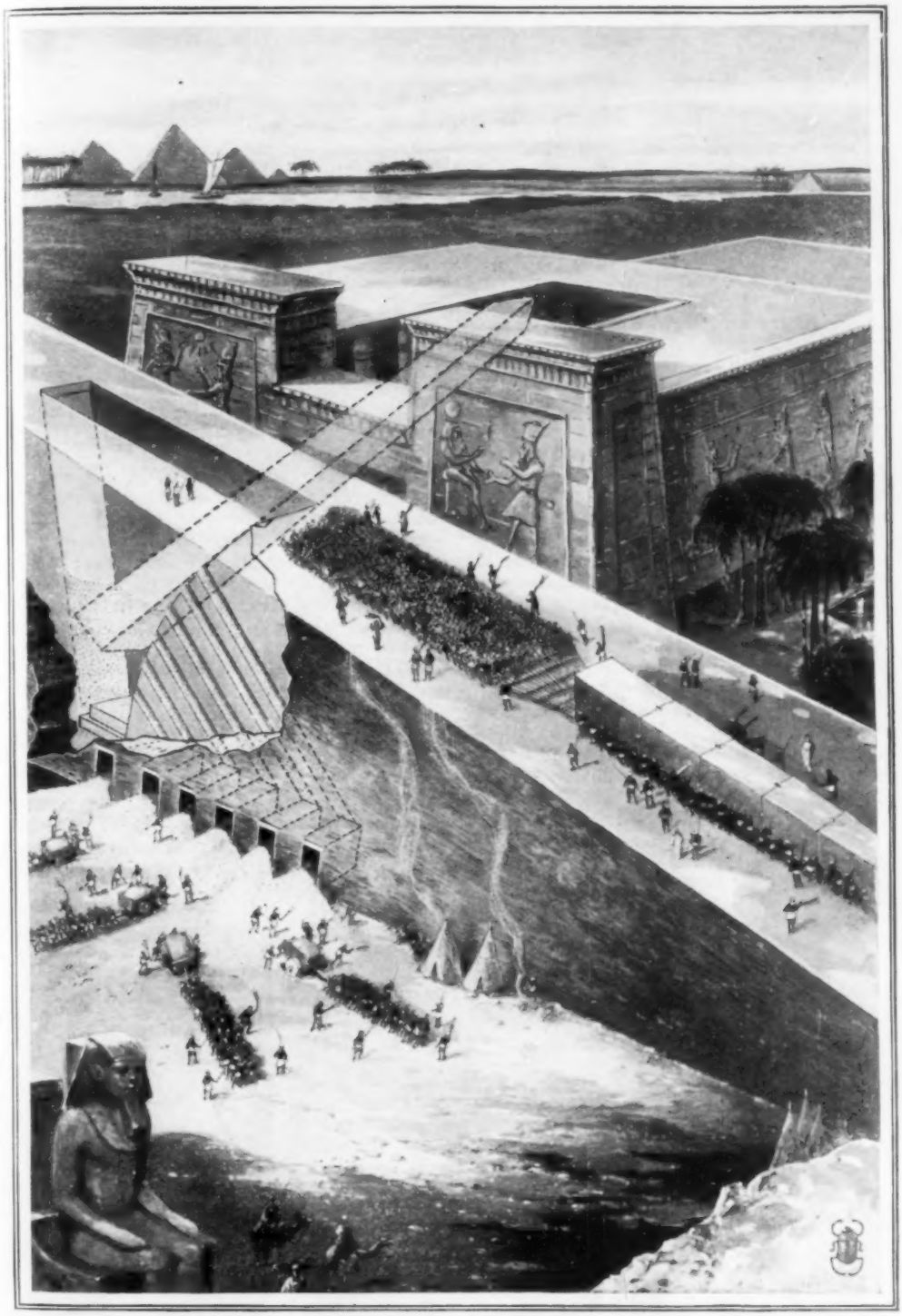
Present Fire-Making by Ethiopian and as It Was Done by the Egyptians



Egypt's Farming Tools Have Changed Little in 3,000 Years; Plow of Pharaoh's Day and as It Is Now Seen along the Nile

Somali Warriors Whose Dress and Weapons Resemble Those in Ancient Pictures of Egyptian Soldiers

Courtesy Illustrated London News



Suggested Solution to Riddle of How Egyptians Raised Massive Obelisks in Position; Dragging Shafts Up Temporary Sloping Planes They Were Lowered to Bases by Draining Sand from Pits

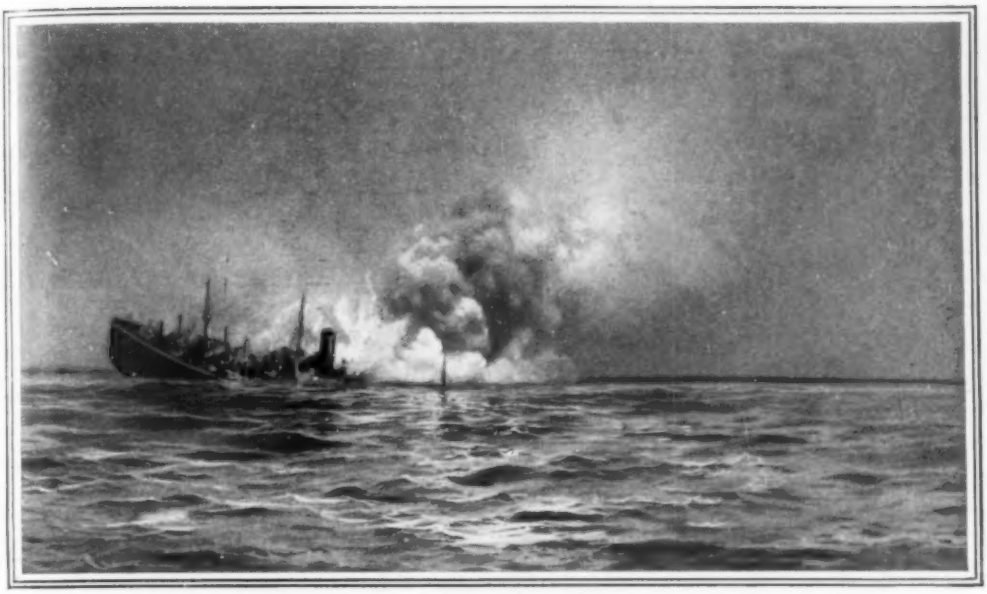
block still containing the rope is preserved in the Egyptian museum at Leyden; and the present writer purchased from an Egyptian native at Luxor a year ago several small pulleys probably employed in an ancient Egyptian loom. Around the bases of the Great Sphinx at Gizeh which once bore the Pharaohs' massive statues, some of which are now in the museum at Cairo, are holes cut in the stone floor and so grouped that it is evident they were used as sockets for timbers which converged at a point over the statue and served as support for the suspension of tackle employed in lifting the statues into place.

While the pulleys used here may have been a great convenience in changing the direction of the applied force without too great loss by friction, there is no evidence that they at the same time multiplied that force. With the exception of the lever no device for multiplying power was known to the ancient oriental world. The multiple chain hoist used by all modern motorboat enthusiasts, and the screw as employed in powerful lifting jacks, involve devices and principles which were unknown throughout the ancient career of man until the Hellenistic age after the death of Alexander the Great, when leadership in power and civilization had long since passed from the Orient to the Mediterranean peoples. Extraordinary as it may seem, therefore, multiplication of applied power as we know it today, played no part in the great engineering achievements of the ancient Egyptians.

Petrie has calculated that the Great Pyramid of Gizeh contains about 2,300,000 blocks of stone weighing on an average two and a half tons each. The building rose 481 feet above its base and the colossal burial chamber, roofed with granite beams weighing fifty to sixty tons each, is situated halfway to the top. To these high levels the blocks of stone were dragged up a succession of inclined planes or ascending ramps, constructed of sun-dried bricks. These ascents were purely temporary and were taken down like scaffolding when the building was completed. In dragging the blocks up the slope not even rollers were employed, for Egypt possessed no forests which could furnish such timber. Nevertheless, about 2900 B. C., the builders of the Great Pyramid, whose great-great-grandfathers had put up the first buildings of stone masonry ever erected, did not hesitate to plan and carry to completion the greatest building ever attempted by ancient man.

After the beginning of the Egyptian empire (1580 to 1150 B. C.), the great conquerors erected monuments involving astonishing feats of engineering and mechanics. The magnificent obelisks of Queen Hatshepsut, the first great woman in history, were wrought each of a single block ninety-seven and one-half feet long and weighing about 350 tons. The quarry work was done in seven months. Both shafts, laid butt to butt, were brought 150 miles down the Nile from the granite quarries at the First Cataract to the temple of Karnak at Thebes, in a single huge barge some 300 feet long, towed by thirty "tugs" of thirty-two oars each. Even these huge blocks were dragged on sledges without rollers. Our own obelisk, now in Central Park in New York City, was first erected by the great soldier Thutmose (Thotmes) III.

Painted Limestone Statuette of Ancient Egyptian Potter, Made almost 5,000 Years Ago, Showing Worker Turning Wheel with One Hand While He Molds Jar with the Other



Courtesy Illustrated London News

War-Time Measures for a Peaceful Cause; the Burning Steamer "Frangestan," Pierced by Shells from a Submarine, Slowly Sinking to the Bottom Where Its Hull Cannot Menace Shipping

Adventure on Liner Afire at Sea Rivals Tales of Fiction

Almost duplicating a scene from a novel of the sea by Joseph Conrad, the British steamer "Frangestan" took fire during passage through the Red Sea with 1,200 persons aboard. The occupants were taken off by other vessels summoned to the aid of the burning ship. Unable to check the flames or save the million-dollar cargo of cotton the craft carried, the commander of a large submarine arriving on the scene, ordered the submersible's gunners to sink the doomed hulk with shell fire, thus ridding the sea of a menace that might imperil other steamers if the hull were left to float unguarded. Enveloped in fire and smoke, it went down a few minutes after the projectiles had pierced its sides.

Cracks in Earth Caused by Quake Peril Travelers in Hawaii

Huge fissures in the crust of the earth, caused by quakes during the recent eruptions of Kilauea volcano, were found in many parts of the Hawaiian islands after the disturbances. Some of the cracks were so large that a full-sized man could walk in them without difficulty. Occurring in roads, they made traveling at night perilous. The violent explosions of the volcano were accompanied by eruptions of sand and ashes and the heavier detonations were followed by showers of rocks of immense size, some of the missiles being hurled three quarters of a mile. Predictions of several scientists that a tidal wave would follow the disturbances caused na-

Man in One of the Large Fissures Caused by Hawaiian Volcano and Earthquake

tives to flee from their homes. Japanese fishermen along the coast took to the sea in their boats.

¶ One of the world's largest mints, which is to have a coining capacity of fourteen tons of silver a day, is being built in China under the direction of an American expert.

Soldiers Protected by Masks Placing Gas Cylinders in Underbrush near Their Barracks to Kill Rats and Other Vermin; Above, Preparing Tanks for Use; Right, Releasing Poisonous Fumes

Rope Machine Is Worked by Hand Twisting Strings into Cords

Several feet of rope can be made in a few minutes by a device recently invented that is so small it can be held in the hands during the operation. Strands of string are placed on the four clasps of the machine while the other ends are anchored to one hook. Turning the crank on the

Twisting Cords into Rope Quickly with Aid of Small Hand-Operated Device

handle twists the strings into cords. By repeating the process with a different gear and the strings replaced by the cords, the latter are twisted into a rope.

One-third of the farm land in Sweden is said to be worked by electric power.

War Gas Now Used to Kill Rats by Army in Porto Rico

Poisonous gases are now being used to check the depredations of rats which annually cause a loss estimated at millions of dollars in food products consumed and wasted. One of the most notable applications of this war weapon to peace-time purposes was undertaken at a United States army post in Porto Rico. The buildings in which the rodents had concentrated were made practically air-tight by pasting papers around the outside of the walls. Gas was then released from movable cylinders into the rooms, and after the latter had remained closed for half of an hour, all of the vermin were found to have been exterminated. Lizards, rats, crabs, cockroaches and other pests succumbed to the deadly fumes immediately. The department of agriculture recently advocated the use of poisonous fumes from the exhaust of the engine of an automobile in cases where rats had gathered in holes in great numbers. Gas from cylinders applied through a hose, however, has been found to serve the same purpose.

Glow of "Moons" on Towers May Cut London's Light Bill

Plans for illuminating the west and west-central districts of London, an area of thirty-six square miles, with enormous floodlights placed on nine towers, 500 feet high and a mile and a half apart, have been presented to the British institute of public-lighting engineers. These brilliant lamps are intended to replace existing installations and are expected to provide a moonlight glow, free from glare and devoid of deep shadows. Promoters of the scheme maintain that it would effect a considerable saving over the present cost of about $2,000,000 a year to light the inner area of the city along its 2,223 miles of streets.

Concrete Tree Trunk Makes Unique Office for Realty Firm

Constructed of concrete, a replica of a giant tree stump serves as a real-estate office in Los Angeles. A large gash on one side, giving the impression that wood choppers had started to cut down the tree at that point, and "roots" seeming to enter the ground add realism to the idea that a huge trunk has been hollowed out. On the flat top a miniature house has been built. The unique structure also helps to advertise the surrounding land to prospective purchasers.

Concrete Tree Stump Used as Real-Estate Office with Miniature House on Top

Electric Mysteries Are Explored by Special Vacuum Tube

By shooting a stream of electrons against the coated end of a glass tube in somewhat the same way that water might be shot from a hose against a board fence, engineers have been able to reveal with a luminous spot such secrets as the changes in an alternating current up to millions of cycles per second, measure the modulations of radio-transmitting stations and explore other electrical mysteries. This is done in a tube designed by Dr. J. B. Johnson of the Western Electric company. Produced by a heated filament, the electrons, speeding at the rate of 6,000 miles a second, pass between two sets of plates. Deflected according to the momentary field set up by the potential difference between them, the stream, as a "weightless pointer," traces, by means of a luminous spot it makes as it strikes the end of the tube, the resultant of the deflecting forces. Neutralizing the oscillations by means of a current of known frequency passed through one set of the plates, determines the changes in the unknown current. The invention is being used to test the performance of vacuum and X-ray tubes, for measuring nerve reactions and for studying other phenomena.

Tube Devised So That the Alternations of High-Frequency Currents May Be Followed

¶To span the harbor at Sydney, Australia, what will be the world's longest single-arch bridge is in process of construction. The span will be 1,650 feet long and 170 feet above the water.

Music—The Soul Behind the "Movies"

Dramatic Action of Pictures Performed to Soft Melodies for Emotional Scenes and "Jazzy" Harmonies for Comedies

SO essential to the success of motion-picture drama has music become, that every studio now has its orchestral staff made up of players who know by memory great numbers of classic selections, popular pieces and "jazz." These musicians are at hand during the filming of both dramatic and comedy plays. Where deep emotions are to be interpreted by the actors, appropriate selections are played to help the character toward the various moods ranging from tragic grief to intense joy.

Although the appearance of a pianist and violinist on a set or in a studio during former days of the motion-picture industry quite often provoked laughter from the company, hardly a member of any of the producing organizations of today would question the value of music for the scenes. Without it, tearful scenes could not be so vividly portrayed by the heroines, nor gladness by the child actors necessary to many of the pictures.

Even the director is swayed by the rhythmic notes of the ever-present musicians who play behind the camera. To him they are almost indispensable aids. Even the principals of the action have their favorite pieces to fit the various parts they are called upon to perform, and the musicians themselves are in numerous cases able to anticipate the progress of the situations and to change their music to suit the drama. Quite often, if the music is not right, the play itself suffers by being poorly acted in "spots."

During the action of the large spectacles orchestras are increased in size. Military scenes are accompanied by stirring strains of martial airs rendered by brass bands, while the pomp and ceremony that attend the acts of royal personages are carried out to classical numbers taken from the long list of music masterpieces. Wedding scenes laid amid the more quiet splendor of big churches or ancient halls are always enacted to appropriate peals of large organs or fitting melodies from orchestras at the rear of the clicking cameras.

When an actor is "keyed up" to a big scene and is being carried along by emo-

How the Motion-Picture Actors Are Worked into Moods by the Power of Music behind the Camera

—o—

Rehearsing a Part for a Screen Comedy with the Help of a Violin and a Portable Organ

tion, a discordant note from one of the instruments may be the means of interrupting the even progress of the situation. The "movie" musician is aware of the value of his performance to the players and carefully guards against the introduction of any notes or pieces that might disturb the moods of the actors. At the same time the orchestra director must know what to play in order to produce the desired effect on the individual actors, in whatever kind of scene they may be taking part. Comedies must have the quick, swinging rhythm found in most popular dance numbers, mixed with crashes and swells to emphasize mirth-provoking moments. Tragedy calls for the opposite class of music with soft, weird parts that serve to work the actor toward tense, dramatic moods.

Sobbing heroines are generally to be seen speaking their lines to music such as Gounod's "Ave Maria," or the intermezzo from "Cavalleria Rusticana." For tragedy and drama a variety similar to the "Prelude" of Chopin and Massenet's "Elegie" has proved to be effective in assisting movie directors to influence the actors to proper interpretations of "heavy" parts. Most comedies are played to-catchy tunes selected from popular musical reviews of the day or current popular songs.

Special kinds of music are used for certain types of pictures. If the play itself is laid in France, the orchestral program will probably be made up of selections from the music of that country. Wherever possible, folklore music and native melodies are introduced into the studios to aid the principals to assume corresponding roles dealing with life in countries represented by such airs.

Frequently, where the companies have to travel great distances to locations for the filming of open-air scenes, the musicians are taken along, and a common sight in and around the country about motion-picture colonies is a group of actors and actresses going through their parts along the roadside or beach to the accompaniment of sharp suggestions from the director mixed with the sobbing of a violin or more weighty throbbing of a portable organ. Sometimes entire orchestras, often selected from near-by theaters or "gardens," are employed to furnish the music for locations or ballroom scenes where the cast consists of hundreds of people taking parts as guests, dancers, attendants, soldiers or fleeing mobs.

One prominent movie star who is frequently called upon to assume difficult roles, always resorts to the music treatment when she fails to acquire necessary moods. On her favorite list of instrumental pieces are several for each purpose.

Prominent Players Carrying Out Emotional Roles in a Movie Scene Aided by a Violinist Who Selects the Proper Music "Treatment" for the Occasion

Airplane "Flies" in Motor-Made Gale to Test Propeller's Pull

To obtain data for new designs, a model plane body has been subjected to tests in a special laboratory at Leland Stanford university. Connected to four wires hung from the ceiling, the model, about three-eighths the size of an ordinary plane, is fitted on a shaft which passes through the body and carries on the front end a 36-inch propeller. From a tunnel in the rear, a forty-mile wind is blown directly upon the "ship" by means of a rapidly revolving eight-blade, sixteen-foot propeller. The front propeller is started and run at a speed of 1,500 to 3,000 revolutions per minute. The experiment is one of a number which have been conducted at the university under the supervision of Dr. W. F. Durand, head of the mechanical-engineering department.

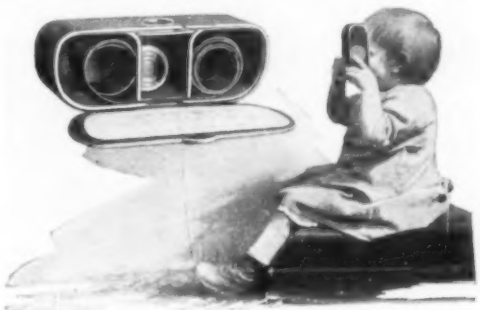
Model Airplane Flying in Motor-Made Gale While Undergoing Experiments for Design of Propeller and Wing Curves in Special Laboratory of Leland Stanford University

Light Rays Increase Lay of Hens by Chemical Changes in Blood

By exposing a number of hens to ultra-violet rays, Dr. J. S. Hughes reported at a recent meeting of the American Chemical Society, the lay had been increased from thirty eggs in January to 144 in February and 138 in March. These rays, or those of direct sunlight, unobstructed by glass, are believed to produce chemical changes in the blood of the fowls. The chickens thrived and laid even in dark coops provided they were exposed to the ultra-violet rays or were dosed with cod liver oil, Dr. Hughes declared, but in complete darkness the blood failed to make use of chemicals needed for producing eggs. The comb of the fowl is believed to be the "aerial" which catches the waves of the rays, transferring the effect to the blood.

Movie Scenes in Pocket Case Are Enlarged by Lens

Selected cuttings from travel films can be enjoyed at leisure with a new instru-

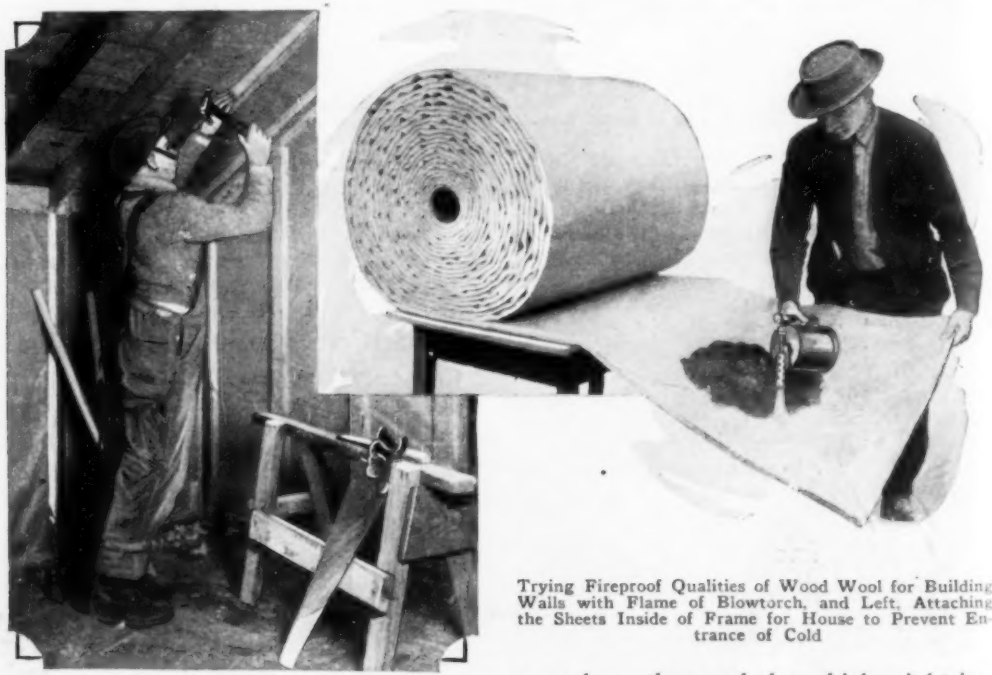


Method of Viewing Scenes in Pocket Movie Machine, and Case Open Showing Film

ment that greatly magnifies the pictures. The device consists of a small case made of wood-pulp composition, so that it is very light. The roll of film is inserted into it and can be moved in either direction by a small handle attached to a rubber wheel that bears against the strip. In front a magnifying lens is fitted and a greatly enlarged view of the scene is obtained when the instrument is held up to the eye. A diffusing screen equalizes the light on the pictures and with the aid of a small projector they can be thrown on a screen, appearing several feet high. Each strip contains forty scenes and a large variety can be obtained, ranging from fairy stories to travel scenes.

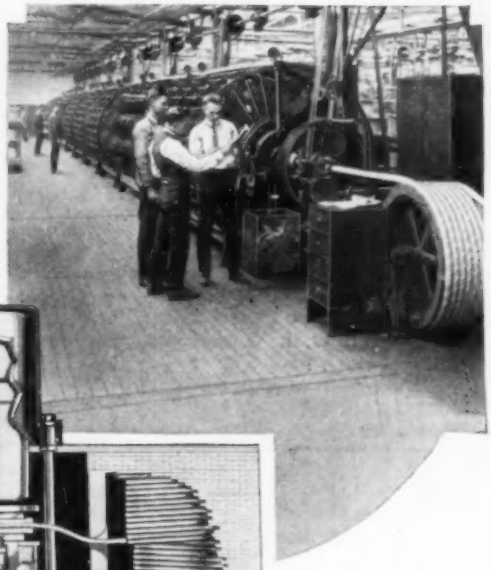
Wool Made from Wood Keeps Homes Warm and Cuts Fuel Costs

When the early pioneers cleared the land and built their homes of tree trunks that were from twelve to fourteen inches thick, they knew nothing of insulation to protect them from the elements. Until recently, insulation in connection with modern building operations, suggested only the precautions taken with electrical equipment and with fire-prevention methods. Today, it means much more, especially in northern states, since mounting fuel costs, the increased expense of home owning and the desire for more comfort in the summertime have shown the importance of insulating material. By careful attention to this matter, thousands of home owners are now saving from twenty-five to thirty-five per cent of their fuel bills each year, the size of heating plants is being reduced and the loss of heat through radiation is being lowered from ten to twenty per cent. What is said to be one of the most efficient kinds of insulating material now in use has been produced by a western inventor from balsam and spruce logs cut into chips and ground and shredded into a wool-like mass which is formed into narrow strips or "blankets." Nailed to the studding before the siding is put on, they effectively keep out wind and cold and prevent loss of heat from within. During the manufacturing process, the material is passed through a chemical bath to render it fire-resistant. It later is mixed with an adhesive and blown against a moving screen in such a way that it becomes filled with millions of dead-air cells which account for its resistance to heat and cold. The strips are covered on each side with an asphalt-coated paper, making them wind, water and dust-proof. No stitches are taken; thus no holes which might impair the efficiency of the material are caused. The finished product is cut into various widths, wound on cardboard tubes and wrapped in bundles, each containing 250 square feet.



Trying Fireproof Qualities of Wood Wool for Building Walls with Flame of Blowtorch, and Left, Attaching the Sheets Inside of Frame for House to Prevent Entrance of Cold

Wrapping Paper Tape around Cable Wire; Right, Diagram of Sheathing Machine



Some of Presses That Turn Out 10,000 Miles of Cable Every Year

© Western Electric Co.

Millions of Feet of Phone Cable Turned Out Every Year

Making the huge spools of wire cables that are threaded below the streets and between poles to carry the human voice, requires millions of pounds of metal and paper yearly, many special machines and hundreds of skilled workers. One plant alone produces 53,000,000 feet of cable annually. After the various quantities of lead, copper, wire, antimony, tin and paper necessary for the manufacture have been assembled, the first step is to insulate the individual wires with paper. This is done in special machines that can put on 2,400 "wraps," or turns, a minute. Different-colored papers identify the two wires of each pair and also certain groups of pairs in the finished cable. The pairs are formed into a cable by a stranding machine, consisting of a number of revolving drums and reels, and at the same time, a heavy wrapping of paper is applied as additional insulation from the outside lead sheath, which is put on later. Stranding is necessary to provide flexibility, for if the pairs were run straight through, the cable could not be bent without stretching some of the wires and kinking others. The core, or unsheathed cable, is then tested, to see that no wires have been broken, and dried in ovens. The sheathing, formed by forcing an alloy of lead and antimony through a hydraulic press, is kept soft but not hot enough to char the paper when the core is drawn through it. The covering fits tightly, and when cooled, the finished cable is wound on the wooden spools and is given a final test to see that it is in perfect condition, electrically and mechanically.

Modern Barbecue Serves Motorists with Sandwiches on Road

Electrically operated and using either gas or charcoal as fuel, a modern barbecue along the Lincoln highway in Ohio has proved popular with motorists desiring hot sandwiches while on the road. The

Roadside Barbecue That Roasts Meats with Gas or Charcoal on Electrically Turned Spit

meat is hung before an open grate in front of the hot coals or flames. An electric motor turns the spit, while a trough below catches the savory drippings which in turn are used for basting. Notches in the two supports that hold the rod on which the meat is suspended, permit hanging at five different distances from the fire.

Swimming Vest Is Puncture-Proof, Weighs Only Eleven Ounces

For the use of swimmers, both expert and beginners, a rubber life-saving vest that has been specially treated to make it

Swimmer Wearing Rubber Life-Saving Vest That Has Four Puncture-Proof Air Chambers

puncture-proof, has been invented. Fitting snugly around the chest, it is held in place by two shoulder straps. There are four air chambers in the garment, each with a check-valve device to prevent the air from escaping. Two ordinary breaths are said to be sufficient to inflate the vest, which, it is claimed, will then support three persons weighing 175 pounds. Rolled up, it weighs only eleven ounces and can be carried in a pocket or handbag.

¶Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

Four-Fifths of All World's Autos Are Found in the U. S.

Out of the approximately 18,000,000 motor vehicles in operation in the world, four-fifths are in the United States, according to a survey. It is estimated that the total increase for one year is more than 3,500,000, eighty per cent of the number being taken up by American purchasers. Although there are 1,075,000 motorcycles included in these figures, only 171,000 are owned in the United States, where over three-fourths of the world's truck output is reported to be in use.

When Tin "Catches Cold"

Extreme cold is known to have had disastrous effects on tin. In countries like northern Russia, it is declared that many utensils often become useless in winter. A whole shipload of blocks of the metal, stored in a Russian customhouse, was reported to have crumbled into dust during the cold months. It has frequently been found in mines in a gray-powder form which, when heated, turns into the shiny metal but, during sub-zero weather, may become dust again. When tin "catches cold," a tiny grayish spot that grows in size, and is joined by others, appears on the surface. In time the metal crumbles away.

Embroidering in Home Made Easy by Miniature Textile Machine

To simplify the making of plastic embroideries, an easily operated machine for home use has been made in England. The material to be worked is first stretched over a frame or ring, right side down, so as to be under tension and perfectly flat. The wool or other material is threaded into the needle and, holding the device in the left hand with the needle over the part to be worked, a wooden knob is pressed down. Needle and thread are in this way carried through the material.

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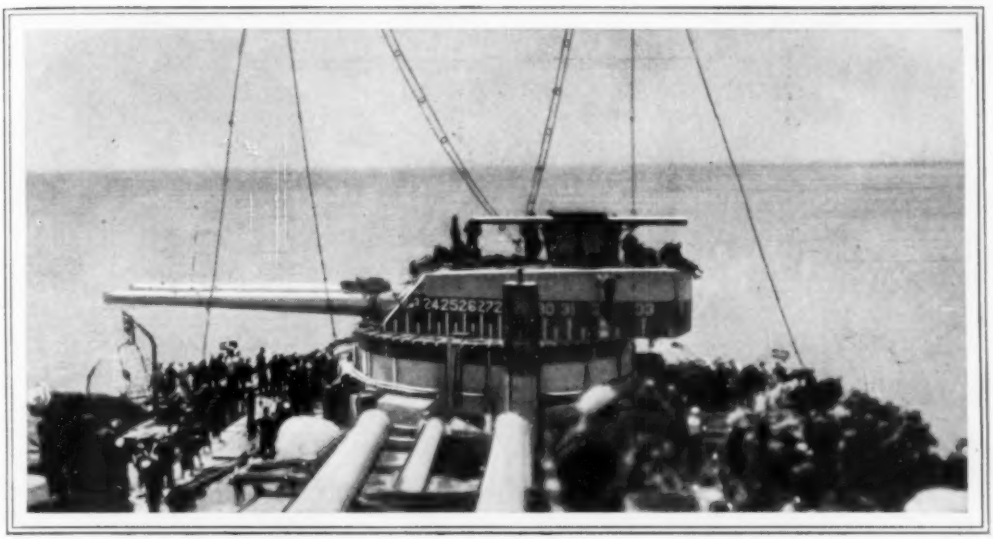

Gun Turret of Big War Vessel with Indicating Dial Set to Inform Gunners of Following Ship of Location and Identity of Target on Which Its Rifles Are Trained

How Guns of Uncle Sam's Fleet Are Trained on Targets

Aiming the guns of Uncle Sam's warships has become an exact science in which numbers painted on the turrets play a leading role. For instance, suppose you are the thirteenth man in a line of twenty-five men, facing a similar line at a distance of 300 yards. You are ordered to shoot at the man who is number thirteen in the opposite line. How could you be sure that you were aiming at the right individual? This is the problem that confronts battleships in a battle between great fleets at sea, in which long lines of ships are firing at one another. In order to give information to the next ship behind, about their target, the turrets are marked with figures, reading from zero, which is dead ahead, around to the right to 360 degrees. A heavy painted white line acts as a marker or point of reference Thus, for instance, if to the ship following behind, the figure nine, indicating ninety, is in coincidence with the white line, it means that its leader fires at the ship in the enemy column which bears ninety degrees.

Art of Native Americans Inspires World Contest in Design

To stimulate interest in creative art, Alfred C. Bossom, treasurer of the Architectural League of New York, has offered prizes in a world-wide contest in designs based on strictly American themes. Indian totems, pottery and ancient forms of architecture are to be studied and compared in search for a distinctive note suitable to modern purposes. Suggesting the possibilities in the idea, a blanket with pattern adapted from the "Thunder Bird" grave totem found in British Columbia was shown as one way in which the weird and

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Comparing Design of Rug to Strange Grave Totem Figures That Inspired Woven Pattern

fanciful symbols associated with superstitions of the ancient artists could be employed as the decorative motif for an article of modern usefulness.

Juvenile Poultryman with Valuable Chickens He Raised

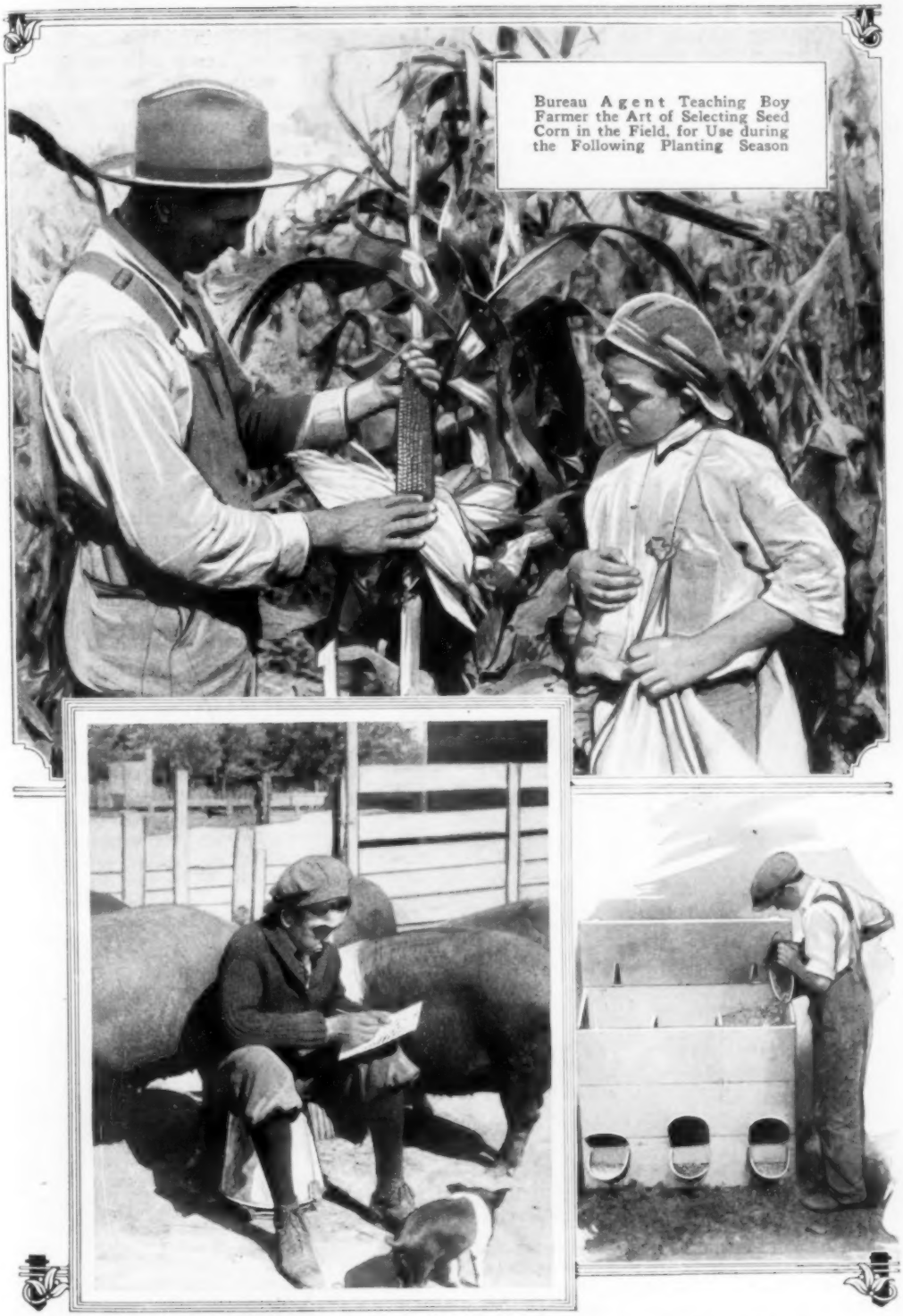
Girl Farmer and Her Pure-Bred Cow

Contestant for Preserving Honors in Uniform at Local Exhibit

Juvenile Farmers Improve Nation's Crops

Half Million Youthful Agriculturists Engage in Raising Prize Cattle and Coaxing Better Yields from Soil

ENGAGED in tasks varying from growing of corn and wheat and raising of dairy and beef cattle to the household arts of making bread and clothing, almost a half million boys and girls of this country are devoting themselves to the study and practice of improving farm life and its products. This army of youngsters was organized a little more than a year ago from the great number of juvenile farm clubs under the supervision, instruction and direction of the department of agriculture. The organizations included in this vast body of youthful student-farmers number 32,673 separate units, representing every section and state of the union. And by demonstration or actual practice they have succeeded in coaxing from the soil larger yields of the staple crops or raising animals that contributed something to the quality and quantity of the nation's food supply. All of them, however, operate with the assistance of government agents, state agricultural colleges or county agents, who give them instructions in scientific farming methods which are put into practice by the youngsters. Boys and girls living on farms were taught the improved processes of agriculture through the efforts of 3,412 instructors and home-demonstration agents. As a result, competitive programs of production were worked out and annual state and local contests decided on the best specimens of cattle, poultry and crops, and even sewing, preserving and baking prizes were offered for the household accomplishments. Field representatives of the government department and co-operating states conducted practical demonstrations on farms where boys and girls enrolled in the juvenile clubs lived. To these classes were shown the best ways to select seeds and to judge the worth of animals by va-



Bureau Agent Teaching Boy Farmer the Art of Selecting Seed Corn in the Field, for Use during the Following Planting Season

By Keeping a Careful Check on Feed and Weights of His Herd, This Young Hog Raiser Weeds Out Undesirable Animals; Right, Filling the Bins with Measured Quantities of Feeding Grains

rious tests. Then, during the planting and growing seasons the farmer apprentices devoted their time to carrying out in actual practice the things they learned from the demonstrations. The young agriculturists went into the fields and selected seeds for the following spring planting, and girls interested in fruits and preserving chose the grades and kinds of materials they desired to use in putting up a supply of such things for future consumption. If these precautions are not taken, the results are apt to be faulty and will cut down the production or success of the undertakings.

Boys were shown the most profitable methods of hog raising and taught how to keep feed charts so they could learn what amount and character of feeds were to be preferred for producing animals of most desirable weights and species. The young dairyman, armed with milk pail and weighing balance, kept close check on his cows to find out just how much milk and butter they could produce under care and feeding planned for him by the teacher-agents. All of these important records were tabulated by the boy himself and resulted in the weeding out of poor producers at the end of the season, leaving for his next experiments only those which showed up on the score card as worthy of a place in the herd.

But the heavier outdoor tasks were not entirely in the hands of the boy farmers. Girls, too, took a wide interest in the fields and cattle yards and many notable achievements by them were registered in the records of the clubs. Poultry raising came in for a large amount of effort from both boys and girls, resulting in the production of highly graded hens with remarkable records of laying. The girls applying their time to live stock were responsible for a great number of pure-bred animals, winning attention from the inspectors who officiated at competitive gatherings where their judgment decided on the most noteworthy achievements for the year among some of the clubs.

In domestic arts, such as sewing, baking and preserving, special instructions were given to the club members by teachers who held classes both in the homes and at club gatherings. Processes for the most successful ways of canning fruits and preserving vegetables were taught. The action of the food chemicals was explained, and formulas for testing and inspection of finished products were illustrated by actual work on the part of the instructors. The making of dresses and millinery also came in for a large share of the girl clubs' attention, and patterns for attractive garments and decorative sewing were laid out and their making explained.

Frequently groups of juvenile farmers combined to operate poultry yards or plots where garden truck could be grown, each member accepting his share of the work and partaking in the profits derived from the sales of the products. Instances have been found where a boy or girl member of a club has succeeded in growing a certain crop in a section of the country where it was thought by experts to be impossible to raise such plants.

Quartet of Youngsters in Dresses They Made, and Boy Dairyman Charting Feed Allowances

Blind Women Weaving Rugs on Handlooms after Having First Memorized the Intricate Patterns through a System of Mechanical Finger Training That Develops a High Degree of Skill

Blind Are Taught to Weave Rugs by Mechanical Finger System

Rug weaving and a variety of other handicrafts are being taught blind adults at the Chicago "Lighthouse" with considerable success. Mechanical finger training plays an important part in the work and enables many of the students to attain a remarkable degree of proficiency. With the assistance of Braille notes, intricate patterns are memorized and the textiles woven. The words "Chicago Lighthouse" printed over an archway to a narrow, wooden sidewalk, leading through a group of portable houses to an old-fashioned red-brick building at the back of the lot, bear a special significance, because the Lighthouse illumines the path for many of the blind. They come from dispensaries, doctors' offices, hospitals and the State School for the Blind, that is, those over sixteen who are Chicago residents. Rug weaving has been found to be a craft at which they show great skill. This work is especially adapted to women and eight to nine looms are kept going. Through the training, many students have been restored to industrial efficiency and financial independence.

¶By transforming the air into a liquid state, chemists are able to obtain various gases important to the commercial world.

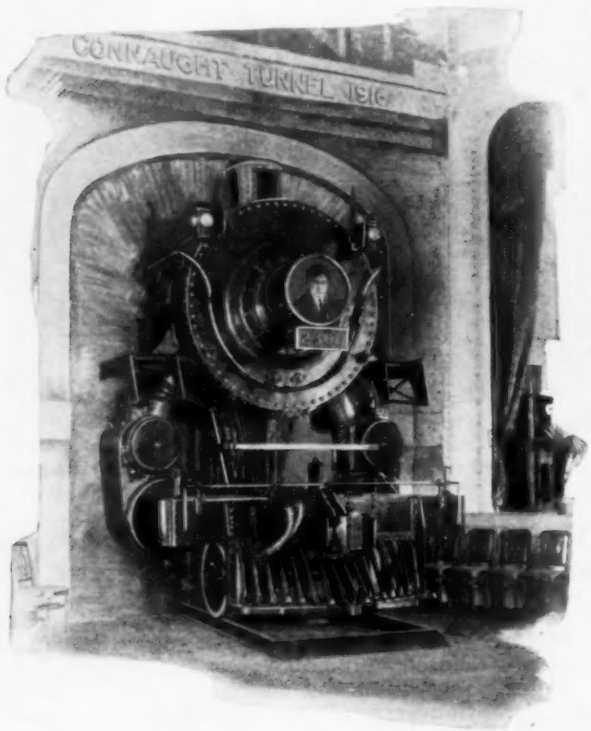
Auto on Railway Wheels Is Adapted to Fast Emergency Service

Fitted to flanged wheels and equipped with a cowcatcher, a seven-passenger closed automobile has been adapted for inspection and emergency service on the Southern railway. It weighs 5,000 pounds, is sufficiently heavy to operate the block signals and has a maximum speed of eighty miles an hour. The engine is controlled by a switch and no steering gear is necessary, as the flanged wheels hold the car securely to the rails. Officials intend to dispatch it as a regular train, and it is expected to save considerable time in speeding doctors and nurses to the scene of wrecks. The car is electrically lighted and is heated by exhaust gas from the muffler.

Automobile "Train," Adapted to Inspection and Emergency Service, Which Is Capable of High Speed

Full-Sized Model of Locomotive Used as Dinner Decoration

One of the features of a banquet of railway executives in Canada was a full-sized model of the latest type of Canadian Pacific locomotives. It was built of wood and equipped with a bell, whistle and electric lights. Not a bolt or bar was lacking to complete the illusion of a perfect engine running on tracks into the room. In the headlight was a portrait of E. W. Beatty, president of the railroad.



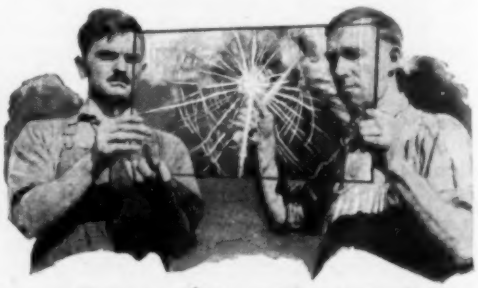
Model of Latest Type of Canadian Pacific Locomotive Built of Wood for Banquet Decoration

Automat Filling Stations to Cut the Cost of Gas and Oil

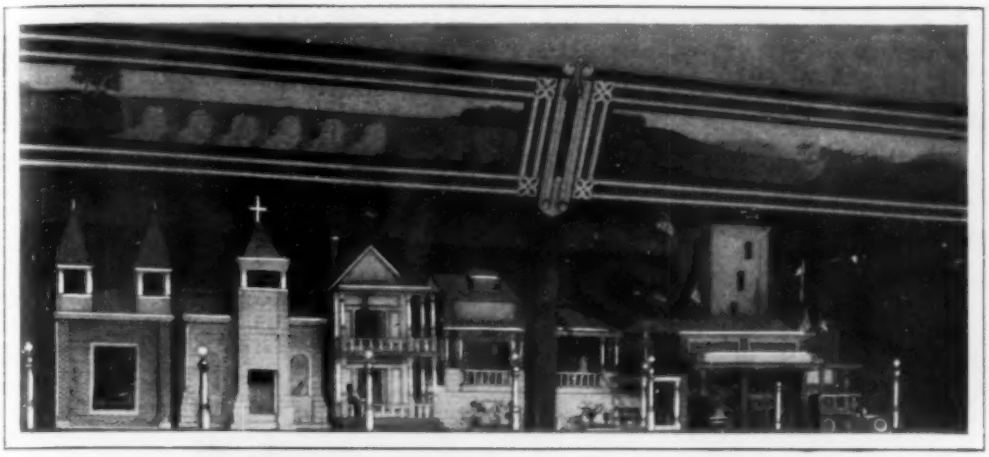
Is the gasoline automat next? The proposal that motorists drive up to a filling station, insert the necessary coins in a slot, fill the tank and replace the hose and tank cap without an attendant's presence, has been advanced in the interest of lower gasoline and oil prices by a special committee appointed by the state of Massachusetts to investigate the cost of commodities used in everyday life. The soundness of the theory remains to be tested, although it is believed that the novelty of the idea would attract considerable trade from the beginning. The committee admitted that it was unable to "find any panacea for the present evils of gasoline business," and put forth the automat idea as a possible way of decreasing the cost of distribution. It has been estimated that there are in the United States something like 50,000 "drive-in" service stations, exclusive of the large number of garages and curb pumps at which gas and oil may be purchased. These have been built within recent years with the later ones established on a more and more attractive basis and with natural beauty and ever-improved service always in the mind of the owners. It is claimed that the automat plan is economically sound in that it would save the salaries of the thousands of station attendants, which saving could be passed on to the consumer in lower prices. The application of the self-service idea in motor oil, it is pointed out, would be more difficult, but could be worked out on a practical scale.

Glass Made to Stop Bullets Will Not Break

Planned to provide an effective screen against rifle fire, a type of bullet-proof glass was given a severe test to show its toughness. Held by two workmen, a pane of it was struck with a heavy hammer. It cracked but did not break through. This kind of glass has been suggested as especially practical for bank and office windows where there is danger of holdups, and for automobile windshields.



Testing Resistance of Pane of Bullet-Proof Glass with Blows of Heavy Hammer



Street Scene in Toy Electric Village, Showing the Town Hall, Church, Realistic Dwellings and a Taxicab on Lighted Street; the Whole Display Rests on an Ordinary Wagon Gear

Many Moving Figures in Toy Town Are Run by Electricity

With 150 figures which are moved by 3,000 pieces of gear, a toy town has been constructed by an Ohioan on the running gear of a wagon. The buildings include a church which contains a miniature pipe organ that will play, a dance hall with a tiny piano and drum that furnish music for couples moving about the little floor, a garage and various shops, all fitted with equipment closely modeled after real articles. Streets and buildings are all electrically lighted and automobiles travel about part of the exhibit. The power and light system includes generators, transformers and motors. Several years were spent in constructing the model.

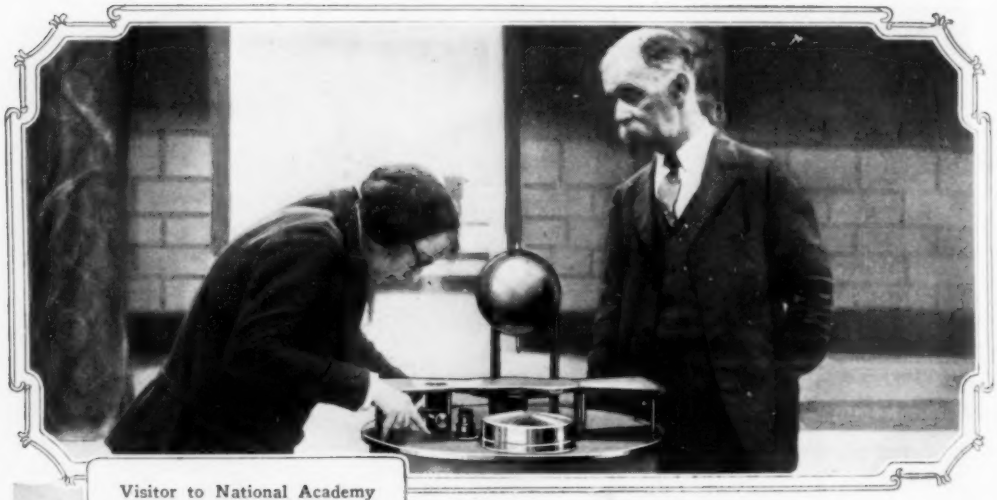
Eyeglass Cleaner That Fits Pocket Prevents Scratching Lenses

To prevent scratching and subsequent clouding of the lenses of eyeglasses, a cleaner and polisher has been introduced. It consists of a metal frame carrying two washleather pads facing each other. To use it, the frame is opened slightly with the finger and the pads passed over the edge of the lens. A few rubs suffice to clean and polish the glass thoroughly. The spring frame provides just the right pressure so it is unnecessary to pinch it with the fingers. With this cleaner, lenses remain in good condition much longer than when polished in other ways, it is claimed. It can be carried in the pocket and is cleaned easily by passing a cloth between the pads to remove dust and dirt.

Double-Walled Oven for Camping Requires But Little Fuel

Designed especially for campers, a double-walled oven with aluminum lining has been invented. It has a heavy iron base to withstand high temperatures, and heat is quickly radiated to the upper parts and retained in the lining, so that less fuel is needed than with other types of outdoor cookers. The device also operates successfully when placed on ordinary ranges or electric plates, and the aluminum inside jacket prevents rust. A metal-lath top is also provided for use when toasting and broiling.

¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described will be promptly furnished by addressing the Bureau.



Visitor to National Academy of Sciences Studying Sun's Spots through Instrument That Reflects Solar Body

Plates Made with Special X-Ray Tubes to Reveal Structure of Human Skeleton

Launching Toy Balloon to Sound Atmosphere in Upper Air Strata

Taking Photographs of the Human Voice

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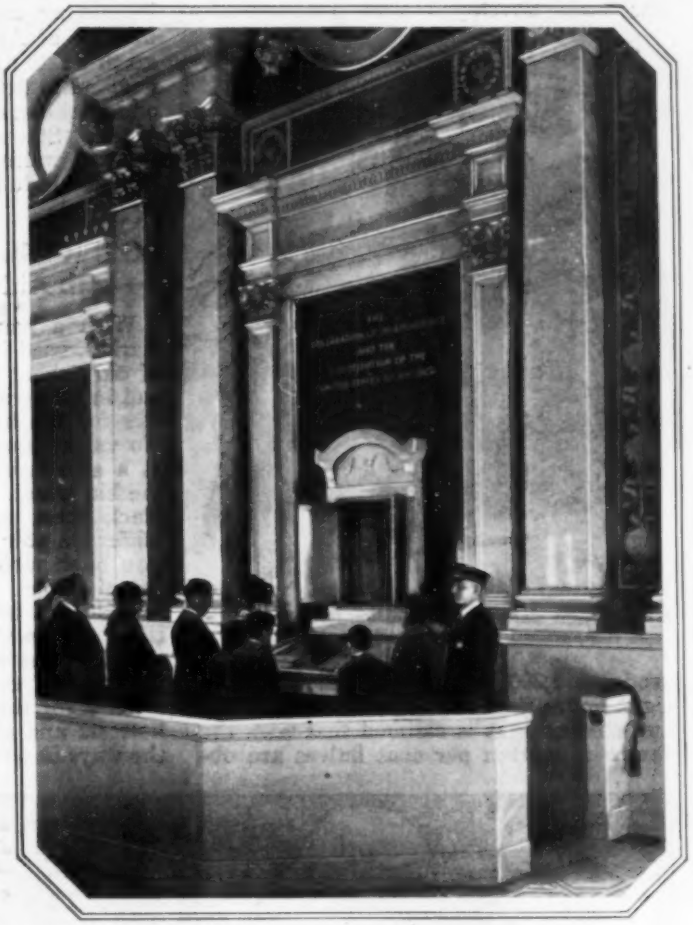
SCIENCE WONDERS SHOWN IN NATIONAL ACADEMY

Presenting the wonders of science in such a simple way that even laymen can understand them, working models and exhibits in the building erected by the National Academy of Science and the National Research Council at Washington, D. C., have already drawn thousands of visitors of mechanical and scientific frame of mind. Within the spacious rooms and corridors of the structure, scores of intricate phenomena and many simpler facts are illustrated. For instance, the spectrum and spots of the sun are made visible to the casual visitor simply by pressing a button and looking through the eyepiece of a convenient stand in one of the halls. The sun's image is reflected from the dome of the building upon the apparatus in such a way that it can be easily studied, and if desired, the rotation of the earth may be observed at the same time by setting a pendulum going, which demonstrates this motion for two hours without further impulse. How the growth of plants is controlled by varying amounts of sunlight, moisture and other factors is illustrated in a series of cabinets; the voice is visualized by talking into a telephone mouthpiece which records the vibrations on a small rectangular screen by pressing a button, and how the human body looks under the X-rays is illustrated in a series of plates taken with special tubes. Among other exhibits is a delicate apparatus which shows the pressure exerted by light beams, and also a demonstration of the way toy balloons are used by the weather bureau to obtain data from air levels too high to be reached by other means.

The science building was erected at a cost of $1,500,000 from a $5,000,000 fund from the Carnegie foundation. Its purpose is to "make possible the harnessing of science to lift the burdens and improve the conditions of all people of the United States." It was dedicated April 28 by President Coolidge with appropriate ceremonies. By many it is considered the masterpiece of Bertram G. Goodhue, famous New York architect, who died five days before it was completed.



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Guarded Shrine Where Originals of Declaration of Independence and Constitution of United States Repose in the Congressional Library

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¶Diamond prices are going up according to dealers who attended a jewelers' association meeting in Chicago. They attributed this partly to the demand for the cheaper stones for drilling in gold and coal mines. Values of the various grades range from $75 to $70,000 a carat and are declared to have doubled in ten years.

Automatic Black-Walnut Cracker Produces Uncrushed Halves

For cracking native American walnuts —the so-called black variety—a machine has been developed that automatically

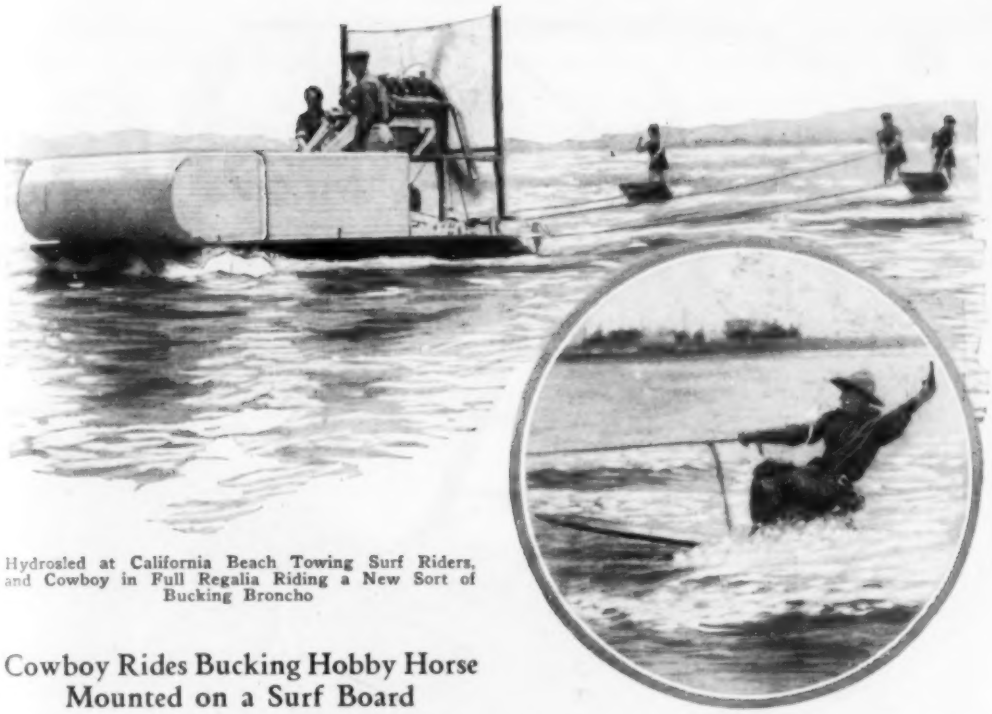
Machine with Capacity of Cracking 1,200 Pounds of American Walnuts in Eight Hours

produces 1,200 pounds of shelled nuts in eight hours, just as they come, big, small and medium. It is claimed that with the device about ten per cent halves are obtained from a wild crop and eighty-five per cent from cultivated trees that yield a uniform product. These are said to bring about double the price of the standard grade, called pieces, which are utilized in making candy. Although millions of bushels of American walnuts are said to go to waste on the ground every year, the demand is declared to exceed the supply, and a million dollars a week is spent in the United States for imported food nuts. Grafted walnut trees are claimed to bear about as quickly as apple trees.

Old Rubber Is Put to Many Uses with Aid of Handy Repair Kit

With a handy repair kit now on the market, used inner tubes and other pieces of old rubber may be utilized in mending and in constructing dozens of useful articles for the home, automobile and camp. No vulcanizing is necessary, it is claimed, as a self-curing cement is provided with the kit, which includes squares of red and black sheet gum, sandpaper for making buffers, a pair of scissors and an instruction book which tells how to make many useful things. Little skill is required and the kit can be operated by boys to help them devise things for camping and for sport. Tube patching, repairing cuts on tire treads, making fan belts and other articles for the automobile, camera cases, holsters and shopping bags, are a few of the ways in which old rubber may be used.

Repair Kit Unpacked to Show Contents, and Sketches of Some of the Articles, Such as Funnel, Rubber Bucket and Cushion, Almost Anyone Can Make with Its Aid



Hydrosled at California Beach Towing Surf Riders, and Cowboy in Full Regalia Riding a New Sort of Bucking Broncho

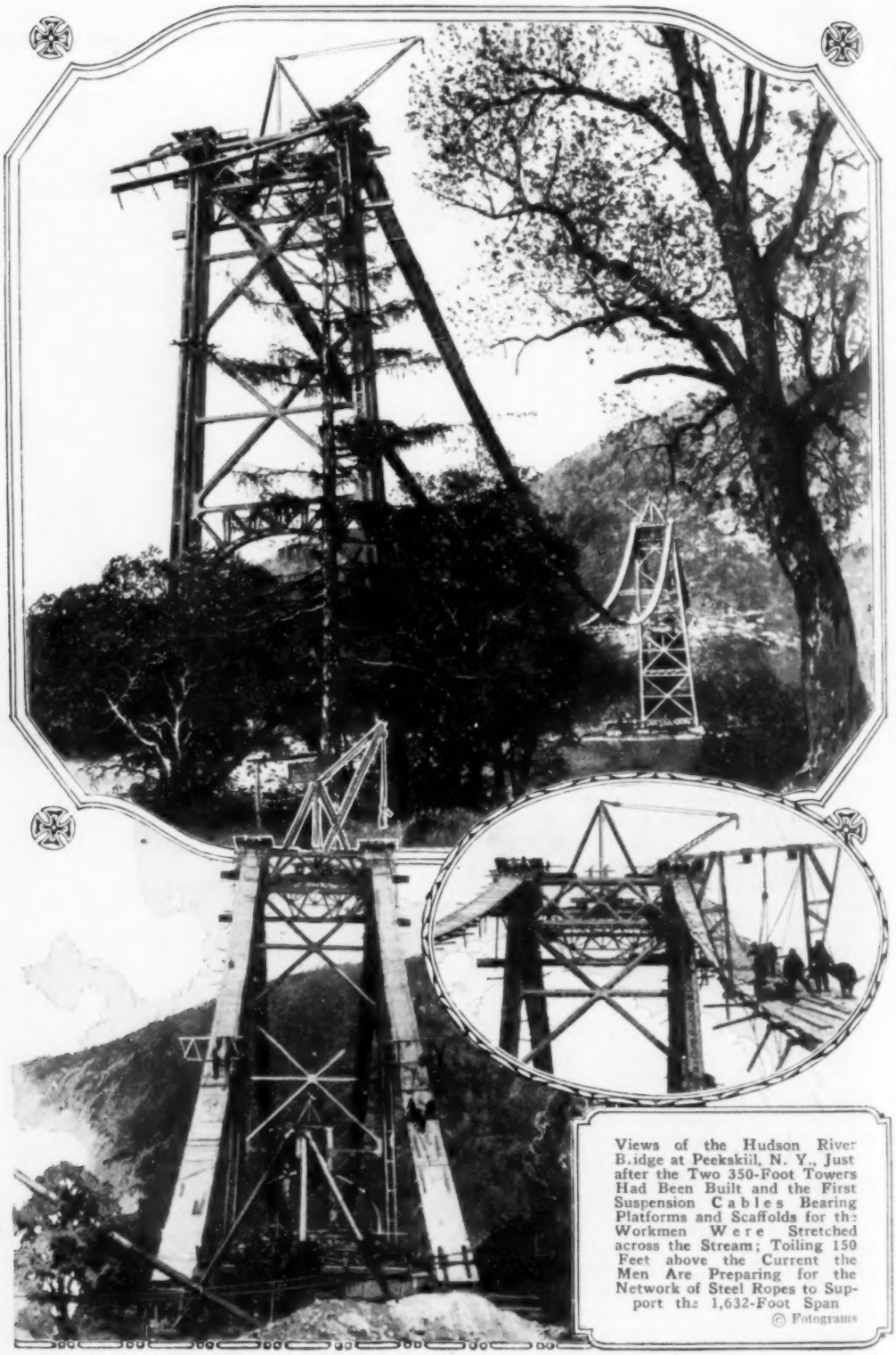
Cowboy Rides Bucking Hobby Horse Mounted on a Surf Board

"Ride 'em cowboy!" The familiar phrase of roundups echoed at a California beach as a "puncher," wearing the regulation attire of the dusty ranges, skimmed through the water while balancing himself on a narrow surf board that swayed and "bucked" in the wake of a speedy motorboat. Shots from his revolver answered the staccato stutters of the exhaust. The stunt was a variation of the sport that rapidly is gaining favor at many beaches. To provide additional thrills, a special hydrosled has been constructed at one resort for pulling adventure-seeking swimmers through the surf. It is capable of forty miles an hour, its inventors claim.

Rabbit "Ranch" in Apartment House Nets Profit from Fur Sales

Running a rabbit "ranch" in an apartment house is reported to have proved so successful for a Georgia man that he purchased a tract of land sixteen miles from Atlanta and now proposes to raise from 8,000 to 10,000 rabbits a year for their skins. The bunnies are of the chinchilla breed and their pelts are said to bring a top price of $15 each and seldom less than $2.50. The real chinchilla, a small rodent native to Peru and Chile, has become almost extinct, but the fur of these rabbits is said to have proved not only an excellent chinchilla substitute but has been used also in place of the brown fox, skunk, ermine and even muskrat, especially for trimmings. The apartment "farm" held eighteen rabbits in four hutches constructed on a trestled arrangement, and only the chinchilla, a comparatively new breed, was raised.

Chinchilla Bunnies Also Proved Desirable Pets before Their Pelts Went to the Furriers



Views of the Hudson River Bridge at Peekskill, N. Y., Just after the Two 350-Foot Towers Had Been Built and the First Suspension Cables Bearing Platforms and Scaffolds for the Workmen Were Stretched across the Stream; Toiling 150 Feet above the Current the Men Are Preparing for the Network of Steel Ropes to Support the 1,632-Foot Span

© Fotograms

Huge Suspension Bridge Will Carry Five Thousand Autos Hourly

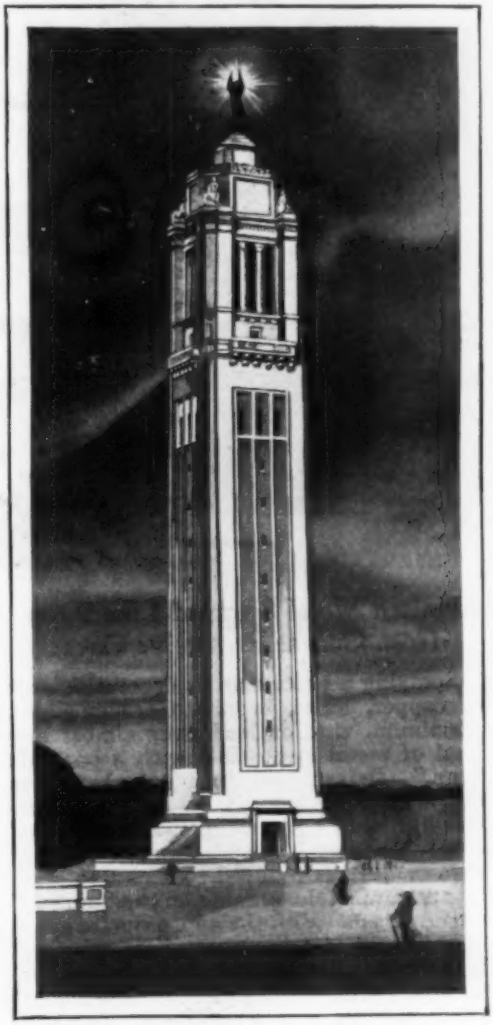
With a capacity of 5,000 motor cars an hour, a huge suspension bridge is being erected across the Hudson river between Bear Mountain and Anthony's Nose just north of Peekskill, N. Y. The single span will be 1,632 feet long, thirty-two feet more than that of the famous Williamsburg bridge. The total length between abutments will be 2,258 feet, the towers are 350 feet high and, at the center, the span will be 157 feet above the river. On each side of the thirty-eight-foot roadway, will be a walk for pedestrians. The structure is said to be the first of its kind ever designed especially for automobile traffic. One of the incidents of its construction was a radio concert for the workmen, the steel girders serving as aerials.

Limit of Man's Endurance to Heat Is Set at Ninety Degrees

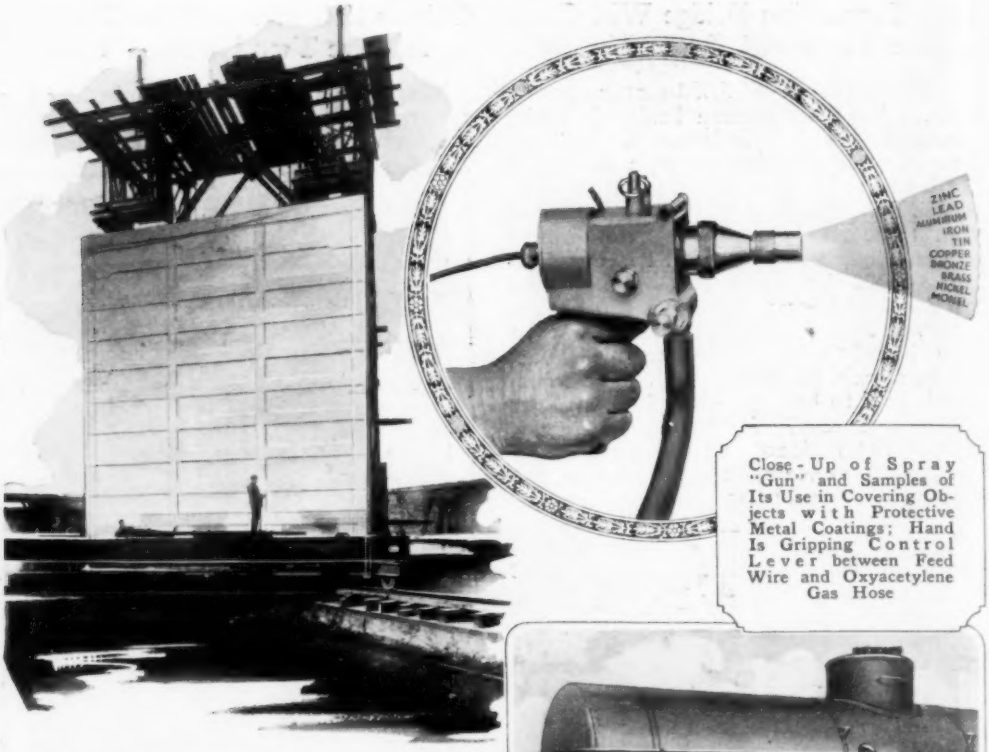
That the human body, in a state of rest and in still air, cannot endure indefinitely a temperature higher than ninety degrees Fahrenheit with 100 per cent relative humidity, is said to have been determined in experiments recently conducted by government scientists. In the course of the tests it was noted that the heavier and stouter men lost more weight than the lighter and thinner ones, but as a rule could endure the heat for a longer period and complained less of exhaustion. Loss of weight was found to gradually increase with higher temperature. Whenever the subject drank ice water he immediately gained in weight and in all cases, within twenty-four hours, regained entirely all he had lost. Those who drank ice water frequently felt no ill effects, tending to disprove the assumption that such action develops cramps. It was found that the exhaustion and weakness following subjection of human beings to a very high temperature and humidity for a short period are not so severe as confinement in air of moderate heat and moisture content for a longer time. The pulse rate apparently determines the extent of the discomfort. Subjects became very uncomfortable at 135 pulsations a minute and complained of unbearable and distressing symptoms at 160 a minute. The highest rate recorded was 184. No marked change in the respiratory rate was noted. Sweat was proved to be the chief factor in producing the inflammation of the eyes which accompanies exposure to heat.

Chimes in Tower of War Memorial to Have Two Hundred Tones

Beauty to eye and ear is embodied in a carillon tower designed as a memorial to the sacrifices and ideals of the American people during the World War. Containing fifty-four bells said to be able to produce 270 tones, the monument is to be erected in Washington by the National Carillon association at a cost of $3,000,000. Columns near the top of the tower will provide openings so that the chimes may be heard at a considerable distance. It is planned to have masters in carillon performance give concerts on the set at appropriate occasions.



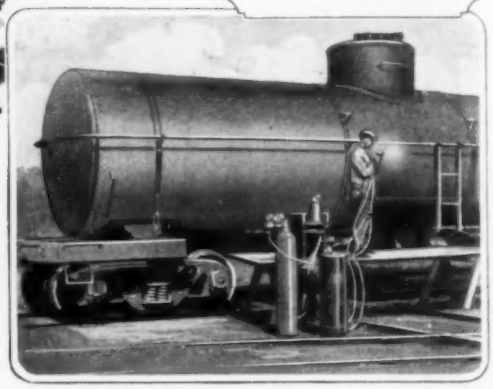
Monument to Be Erected That Will Have Bells in Tower for Playing Chimes



Close-Up of Spray "Gun" and Samples of Its Use in Covering Objects with Protective Metal Coatings; Hand Is Gripping Control Lever between Feed Wire and Oxyacetylene Gas Hose

Molten Metal Sprayed Like Paint from Gun as Protective Cover

Spraying a protective or decorative coat of copper, brass, bronze, German silver, aluminum, zinc or lead over almost any kind of metal is possible with a portable "gun." Defects may be repaired, statues and ornaments coated, and various surfaces protected from chemical action and rust. The metal, supplied in the form of wire or dust, is reduced to a molten state by an oxyacetylene flame at the "muzzle" of the device. With the approximate speed of a rifle bullet, a fine blast of molten metal is blown by compressed air upon the surface to be treated. As thick or thin a coating as desired may be applied. The supply of "ammunition" and the amount of gas and air are all controlled in the gun, which is held just a few inches from the surface and moved about. The eye is able to detect the thickness of the layer deposited and any parts that may escape a first spray. The control is so accurate that a blast fine enough not to ignite a match, a stick of smokeless powder or the thinnest paper may be applied. Several small articles weighing from a few ounces up to ten pounds each may be treated simultaneously within a cabinet arrangement.



Glass Industry Is Helped by Autos Which Use Half of Output

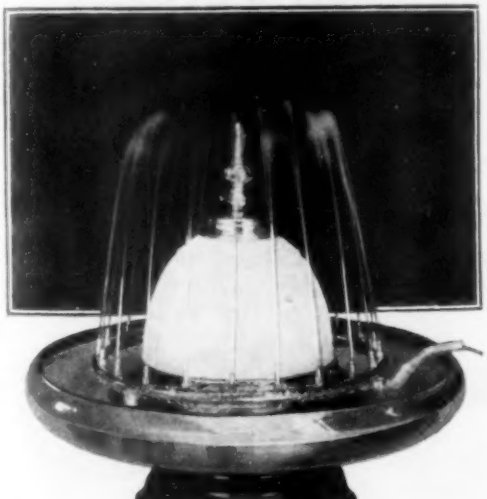
More than one-half of the plate glass consumed in this country is used by the automobile trade for windows and windshields, according to a survey of the industry. The growing popularity of closed cars is declared to be an important factor in the increased consumption. There are four general classes of glass, window, plate, wire and obscured, each having numerous varieties. Compared to the first two, the production of the others is said to be comparatively small. The making of window glass is being revolutionized by the use of newly invented processes. Instead of being blown into cylinders, the glass is drawn directly out of the melting pot tank in the form of a flat, continuous sheet.

Electrical Prospecting Is Tested in Search for Metals

Prospecting with electricity on the surface of the ground for minerals hidden in the earth is being tried by a large zinc company at its mines in New Mexico. The method is one worked out by H. Lundberg, a Swedish engineer, who claims that it has been used with good results in Norway. The presence of metals below is determined by the relative conductivity of the rock, as shown at many points for a given area between two parallel charged wires. Similar tests have been made in Wisconsin and the process is being closely watched by mining engineers, who believe, that, if it is successful, it may prove of great value.

Humidifier Spray Uses Same Water Continuously for Fountain

Requiring no connections to a water pipe, an electrically operated humidifying fountain that can be used as a decoration in the home or office, pumps the same water over again through small nozzles in tiny jets. When working, the spray is illuminated by incandescent bulbs and a hidden motor does the pumping. As the water in the bowl evaporates it may be easily replenished. The height of the jets can be



Electric Humidifier Fountain for Home Which Pumps Same Water Continuously through Jet Nozzles

regulated. Power for operating the humidifier can be supplied by current from an ordinary light socket.

Collapsible Canoe Carried on Auto Has Seats for Two Persons

For the automobile tourist who likes to fish and paddle, a collapsible canoe has been imported from Germany which can

Collapsible Canoe Carried on Fender on Auto Trips, Which Can Be Assembled in Ten Minutes

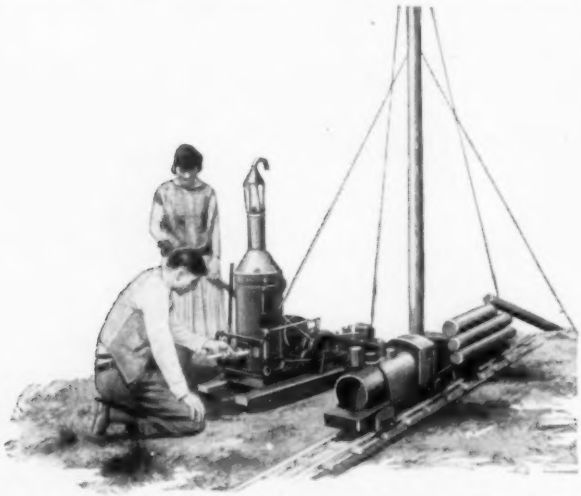
be packed in a bundle, six inches in diameter and forty-eight inches long, and weighs only thirty-five pounds. When assembled, which can be accomplished in ten minutes, it is fifteen feet long, with waterproof spray shields at each end, and seats two people in comfort.

Time-Saving Peanut Harvester Digs Vines and Piles Them in Rows

Peanuts are harvested quickly and with considerably less labor than by hand with a horse-drawn machine that digs up the vines and piles them in rows where the nuts can be separated easily from the roots. When the digger is started, a flat, pointed shovel passes under the surface at a sufficient depth to catch all the nuts. As the roots are cut off, they pass up an endless slatted elevator where most of the dirt is shaken off. They may then be dumped directly into the furrow, or on either side of the machine, by a conveyor which runs transversely to the elevator. All parts of the machine are moved by the traction wheels and are easily controlled by the driver.

Logging Is Taught by Miniatures Run by Forestry Students

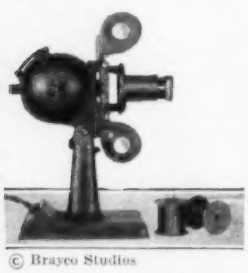
With a miniature "donkey" engine and a toy railroad as "teacher," students in the forestry department of the university of Washington receive practical demonstrations of the latest methods in logging operations before they face actual work in the deep woods. The tiny engine is complete in every detail even to a special spark catcher attached to the smokestack. It operates under its own steam and runs a hoisting tackle that puts small pieces of wood upon a model flat car attached to the "dummy" locomotive.



At the College-Campus Logging Camp; Firing Up Toy Engine for Hoisting Test

Glass Slides Replaced by Films in Fireproof Stereopticon

Designed to project still pictures from small strips of standard film instead of glass slides, a new type of stereopticon has been placed on the market. It is claimed that the machine can be operated from any electric-light connection. An insulating device protects the film from the heat. Pictures can be projected at any distance from thirty inches to thirty feet, it is said, and may be kept on the screen for hours, if need be, without any fire hazard. A film strip contains from fifty to 500 separate views and can be moved backward or forward, making it possible to refer instantly to any one of them. On the other hand, it is pointed out, a hundred pictures may be thrown on the screen in less than a minute. Weighing less than five pounds, the whole apparatus, together with several thousand views, can be put in a desk drawer or carried in a handbag.



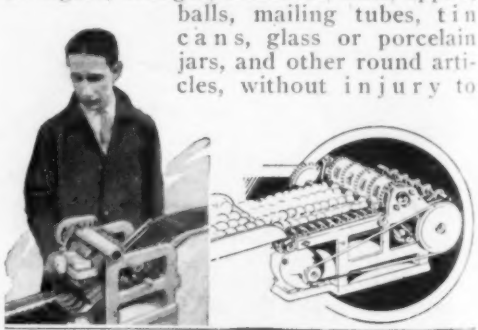
© Brayco Studios

Colorings of Butterfly Rivaled

Science has outdone the paintbrush of nature, according to a recent announcement, in which the contention is made that by artificial means the coloring of butterfly wings can be reproduced with much more effect and richness than the originals themselves. The hues in real wings are brought about by light reflections on the same principle which causes soap bubbles to glisten, according to the discoverer. To get similar results artificially, he said that resin was used as the basis in the experiments.

Printing Cigars or Oranges Saves the Cost of Labels

Electrically operated, a machine that prints directly on round or cylindrical things, doing away with the expense of having labels, has been placed on the market. Trade-marks or names can be printed on cigars, oranges, tomatoes, nuts, apples, balls, mailing tubes, tin cans, glass or porcelain jars, and other round articles, without injury to them, it is said, and at a speed of from 3,000 to 30,000 an hour. It is claimed that the press does in one operation what now takes two or more.



Machine Printing Trade-Marks Directly on Cigars and Oranges, Saving Cost of Labels

Motor-Driven Knife That Cleaves Its Way through Several Layers of Cloth; Designer Inspecting a Sample Suit Model and Cutter Notching Cloth to Guide Sewers in Assembling Pieces

Clothing the Men of a Nation

Power Sewing Machines and Motor-Driven Cutters Complete Thousands of Suits a Day in Tailoring Factories

PUTTING the men of this country into well-made clothing of up-to-date fashion equal in finish to the natty hand-worked attire of a half century ago when the neighborhood tailor was the sole source of dressy garments, is the task of hundreds of factories which now turn out thousands of suits of popular cuts, designed by their own style creators. Transforming bolts of cloth into men's ready-to-wear has become such a widespread industry that it is estimated to now employ more than 200,000 workers, most of whom are specialists in the various operations which combine to keep the man and boy well dressed. Power-driven sewing machines that take a thousand stitches a minute and keen, motor-operated knives that whirl at great speeds through stacks of cloth several layers thick, to trim the materials into shapes later assembled by hand, are but part of the inventions that help to relieve the tremendous demand for wearing apparel. College students, sportsmen and business and professional men, all are supplied with various styles of garments by artistic designers who arrange appropriate models for each class

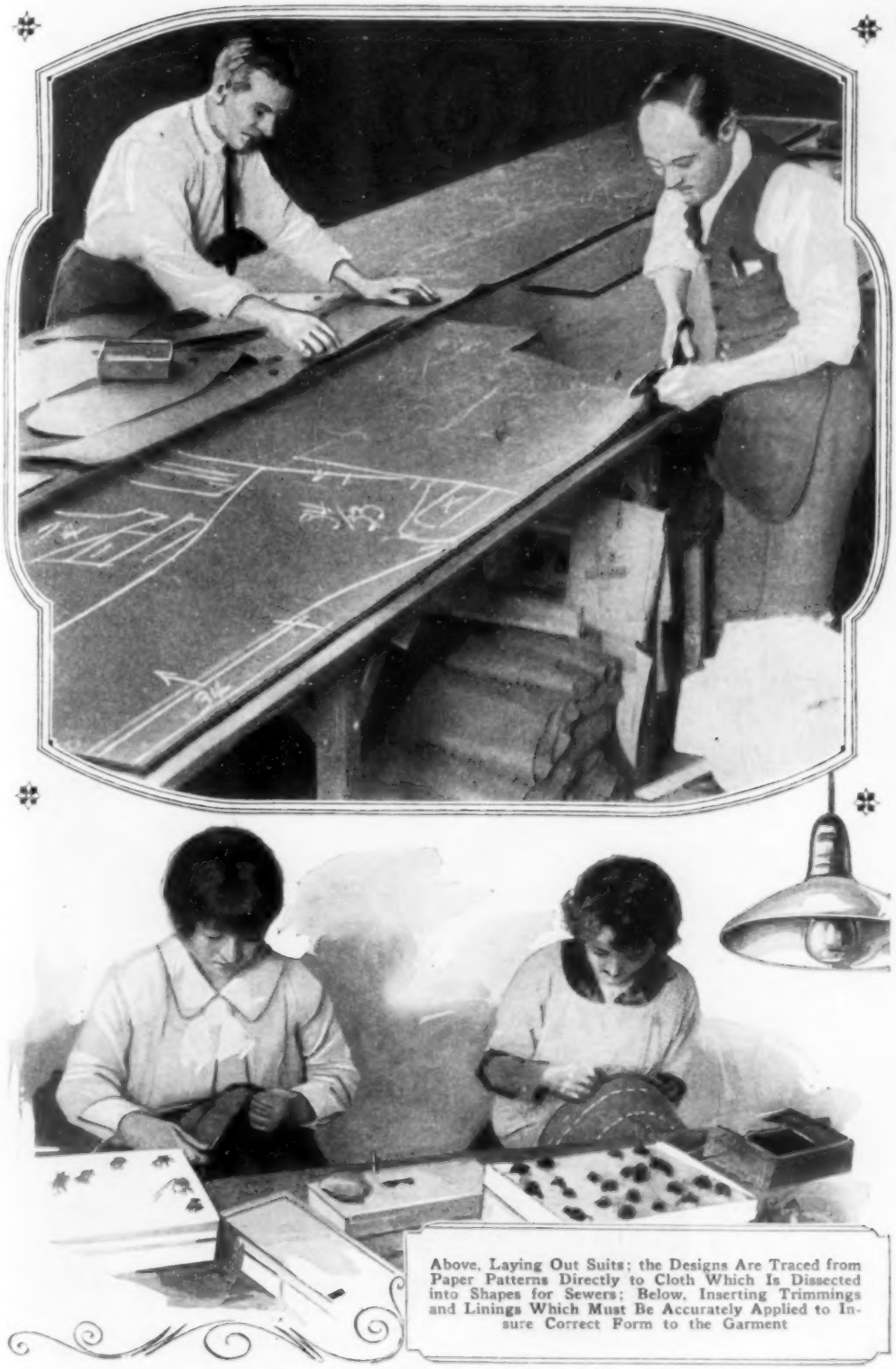
Before Machinery Came, Spinning and Weaving Were Done in the Homes Where Most of the Clothing Also Was Made

of buyers. By keeping a season or two ahead of the scheduled appearance of the fashions the designer is able to deliver to the humming factories, patterns that can be completed in time for seasonable buying in the retail stores.

After the model has been sketched on paper, special sample suits are made from the drawing and used as guides for selection by the manufacturers. When adopted as part of a "line," a master pattern is cut, and from this larger and smaller sizes are figured. Hundreds of bolts of cloth are unrolled, sponged, sorted and started through the process of cutting and assembling. If the cloth is of highest woolen grades, the operations are performed by hand, but with the more common grades machines are almost entirely used for the preliminary work. The cutter, equipped with a motor-operated knife, dissects the webs of material according to pasteboard patterns that have first been carefully measured for accuracy and fit. Laid out in piles of four to six layers the cloth is cut for as many suits at the same time. Special machines make the openings for buttonholes and mark the spots for the buttons. Shortly after a consignment of cloth from the woolen mills reaches the factories, it is subjected to a thorough test to insure its suitability to the requirements of tailoring standards. Its strength is tried in a pulling appliance where each bolt is unwound and clamped in steel jaws that exert stretching strains upon the fibers. If the piece of cloth tears under certain stresses, it is rejected. All accepted material is sent to examiners where it is passed through apparatus equipped with a background of strong lights. By carefully watching the web as it slowly travels over these lights, experts detect imperfections in weaving or dyeing and any other faults, marking each spot by sticking a small white flag at the place to warn the cutters, who avoid such portions.

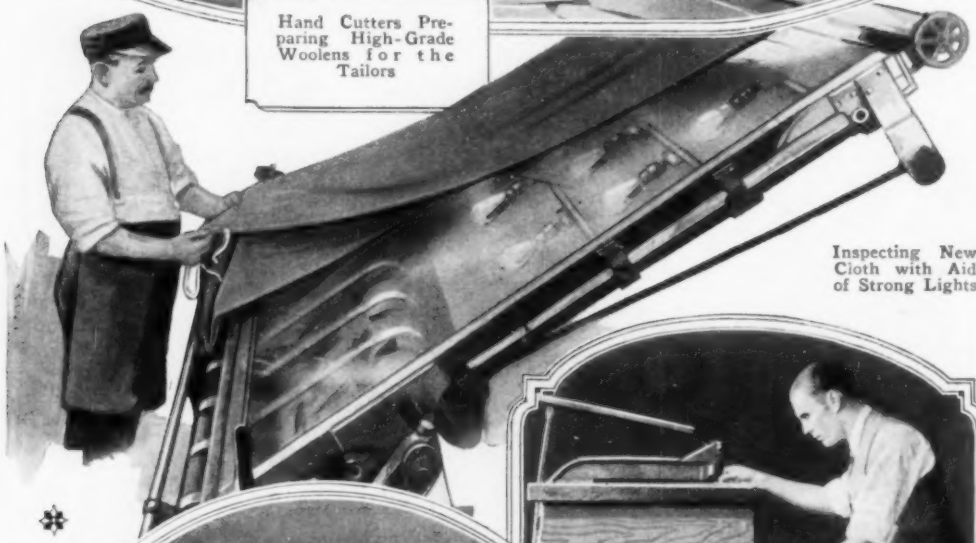
Having passed all inspections, the cloth is sent to the sponging room where it is treated with high-pressure steam which results in shrinking and pressing it before it is rewound into bolts. Even the tape used to hold the finished suit in shape is shrunk to conform with the woolen cloth. Linings are prepared in advance of the assembly of the suits, from more than thirty different kinds of fabrics, all cut by power cutters to accurate patterns. As it goes to the sewers, the suit is a ragged looking bundle of pieces of cloth, decorated with miscellaneous tags and instruction sheets which are to guide the assemblers in their work. When this assortment has all been put together, it goes to pressers who iron out all creases and wrinkles and remove any hanging threads or bulges along the seams. Inspectors carefully check up the finished garment with the guide slips and tags.

Marking and Cutting Pasteboard Patterns Which Are to Guide Cutters in the Shaping of Suit Pieces; Above, Presser Removing Creases and Wrinkles from Finished Garment

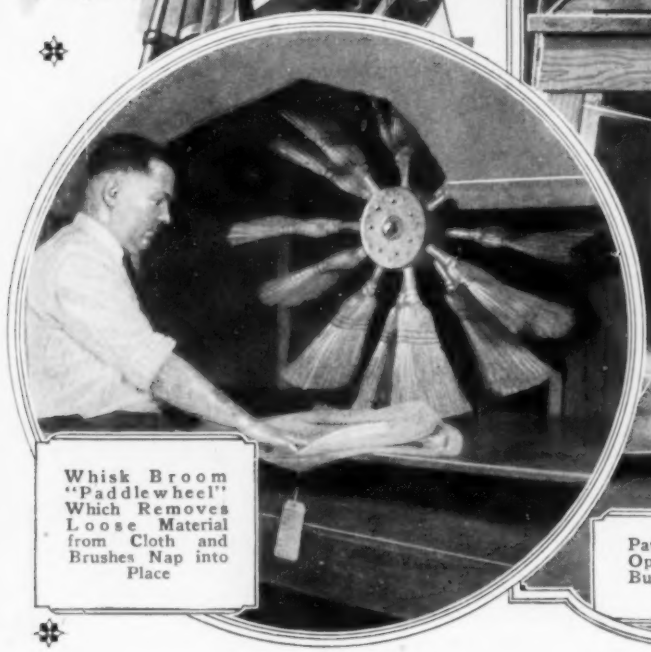


Above, Laying Out Suits; the Designs Are Traced from Paper Patterns Directly to Cloth Which Is Dissected into Shapes for Sewers; Below, Inserting Trimmings and Linings Which Must Be Accurately Applied to Insure Correct Form to the Garment

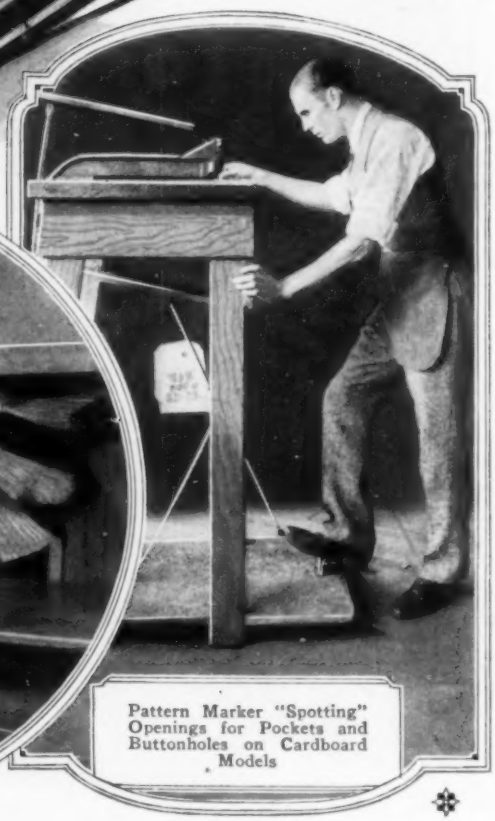
Hand Cutters Preparing High-Grade Woolens for the Tailors



Inspecting New Cloth with Aid of Strong Lights



Whisk Broom "Paddlewheel" Which Removes Loose Material from Cloth and Brushes Nap into Place



Pattern Marker "Spotting" Openings for Pockets and Buttonholes on Cardboard Models

Diving for Gold Lost at Beaches Keeps Life Guards Busy

Diving for rings and bracelets that slip from the hands of swimmers every year is one of the tasks of life guards at Belle Isle, near Detroit, Mich. With their eyes tightly covered with goggles to exclude the water, they are able to descend quickly to a depth of several feet by exhaling most of their breath before submerging. When the bottom is reached, the guard lies flat on his stomach, and taking care not to cloud the water with mud and sand, pushes himself slowly along with his hands. Sometimes, the lost article can be detected at once sticking up through the sand, but often repeated descents are necessary. With slight practice, the "sinking dive" can be mastered. It is especially valuable in this sort of work as it enables the diver to reach the exact spot where the lost article is supposed to be and does not greatly disturb the water, thus making clear vision possible. From twenty to thirty rings are found each season by the life guards at Belle Isle and occasionally, they are asked to recover sunken sets of false teeth, pins and other articles lost by swimmers.

Automatic Cigar Lighter Serves as Handy Paper Weight

Constructed of bronze so that it may be used as a paper weight, a cigar lighter has been marketed that ignites by pressing down a handle. It is claimed that there is practically no maintenance cost, as one filling of alcohol will last a year and there are no wires, coils or batteries to get out of order. Specially designed models for clubs, hotel lobbies, theater foyers and similar places are manufactured to harmonize with the furnishings. Equipped with ash tray, cigar rest, cigarette snuffer, automatic self-closing inkwell and places for two pens, other models are made for hotel-desk and office use. When the lighter is mounted on a square base that has its four sides fitted with transparent material, advertising matter may be inserted and changed as often as desired.

Transparent "Overalls" Add Beauty to Dresses and Save Gowns

Quickly and easily slipped on, a transparent overdress which is said to transform the simplest looking frock into a

Copyright, Underwood & Underwood

Simple Frock That Has Been Transformed into Expensive-Looking Gown by Transparent Overdress

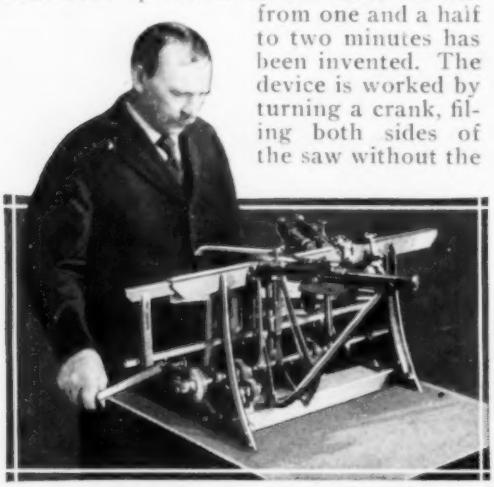
vision of beauty has been designed. It is also claimed to protect delicate gowns from dust and wear, keeping them looking fresh at all times and permitting them to be worn in offices without danger of soiling. Of a lacy substance and loose-fitting, the "overall" can be put on in a moment.

Autos Take Lead over Telephones as Popular Utility

For utility and convenience automobiles have become more popular than telephones in this country according to tabulations made by a motorists' club. At the beginning of 1924, 15,000,101 telephone instruments were in use, while the automobile "population" has grown to 15,221,153. The greatest stride in the increase of cars was made last year when the total registration numbered about twenty-three per cent more than for previous records.

Saw Filing and Setting Machine Is Operated by Crank

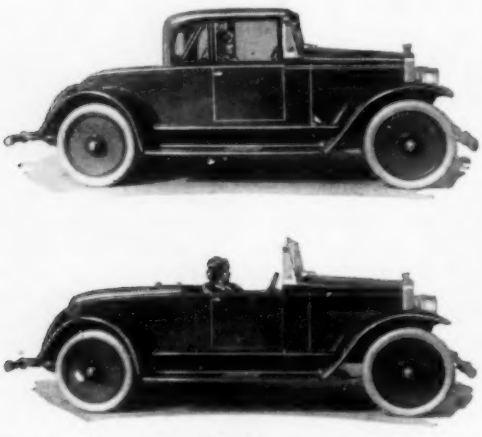
To sharpen and set the teeth of saws quickly and accurately, a machine that does both operations at the same time in from one and a half to two minutes has been invented. The device is worked by turning a crank, filing both sides of the saw without the necessity of changing its position in the vise. By connecting to a pulley, the largest teeth may be sharpened and set as easily as the smallest. The device may be placed either on a workbench or a special stand.



Inventor with Machine That Files and Sets Teeth of Saw at Same Time

Disappearing Top Quickly Converts Roadster into a Coupe

Simply turning a crank in a cleverly designed roadster now on the market, raises a movable top concealed in a rear compartment into position over the seat, and transforms the car into a cosy coupe. The top is easily returned to its original position and its front end fits upon the windshield. Special curtains attached to the doors and sides complete the coupe effect. Rods with which the top is raised, serve as braces when it is in use, and screws are provided to clamp it securely to the back of the car and keep it from rattling.



Roadster with Coupe Top Raised and Lowered; the Change Is Quickly Made with a Crank

Swiftest Way to Girdle the Earth Is Still by Land and Water

Although the round-the-world airplane flight already has established new flying records, it will not break the existing speed mark for circling the globe. Before the participants were halfway on their journey, they had taken more than twice as much time as was required by John Henry Mears of the New York Sun who, traveling by land and sea, made the trip in 1913 in thirty-five days, twenty-one hours, thirty-five and four-fifths seconds, bettering the performance of the mythical hero of Jules Verne's story by more than forty-four days. He covered an average of 587 miles a day. Notable among other journeys are those of Capt. W. D. Seymour, who in 1876 made the trip in 117 days, Nellie Bly's record of seventy-two days, six hours, eleven minutes and fourteen seconds in 1889, lowered by about five days by George Francis Train the following year. His mark was bettered by nearly a week in 1901 by Charles Fitzmorris, of Chicago. This record was then lowered by Henry Frederick, Col. Burnley Campbell and by Andre Jaeger-Schmidt, a Paris journalist, who held the record until Mears made his notable trip.

Photographic Power of Wood

Experiments have shown that a section of a tree trunk, or of a branch, cut across the grain, possesses the power to impress upon a photographic plate in the dark a distinct image of itself, plainly showing the rings of growth. There is a great difference in the intensity of this power in different woods. The conifers—pines and firs—have it in high degree. The wood is placed either in contact with the plate or a short distance from it and the exposure varies from a half to eighteen hours. Boards long exposed to the air, an oak box 100 years old, a decayed stump and even bogwood have been found still photographically active.

Folding Hunting or Fishing Boat Fits Auto Running Board

For fishing or duck hunting, a folding boat that may be carried on the running board of the automobile as a carrier for part of the camping equipment has been designed by an experienced Long Island yachtsman. It consists of two sections, each of which may be used as a separate boat, if desired, and will support the weight of a full-grown man. Extended, it is ten feet long, three feet wide and one foot deep. It is half that length when folded and may be used with a portable motor.

Cruising over Inland Lake in Folding Boats; How Craft Serves as Shipping Container for Camp Equipment, and Converted into Motorboat by Attachment of Small Gasoline Engine

Bridge Built on Wheels Installed in Place of Old in Four Hours

Building a railroad bridge on two sets of car wheels and transporting it to the site was the unusual engineering achievement recently accomplished by a Pennsylvania wrecking crew. The job consisted in getting rid of an old fifteen-span trestle and substituting for it two spans of deck-plate girders, each eighty-five feet long. The new structure was built in shops with blueprints as the only guide to accuracy. When completed, it was bolted to the wheels and moved to a sidetrack near the creek. The wrecking crew had four hours in which to make the substitution. With the aid of a derrick on both sides of the stream, the new bridge was lifted from the rails and held in mid-air over the old trestle spans as they were cut loose and pulled away. It was then lowered into place and was found to fit perfectly.

"Artillery" of the Fire Fighters: Sweeping the Flames in a Skyscraper Fire with a Powerful Stream from a Swiveled Nozzle Attached to a Lofty Water Tower

The Passing of the Fire Horse

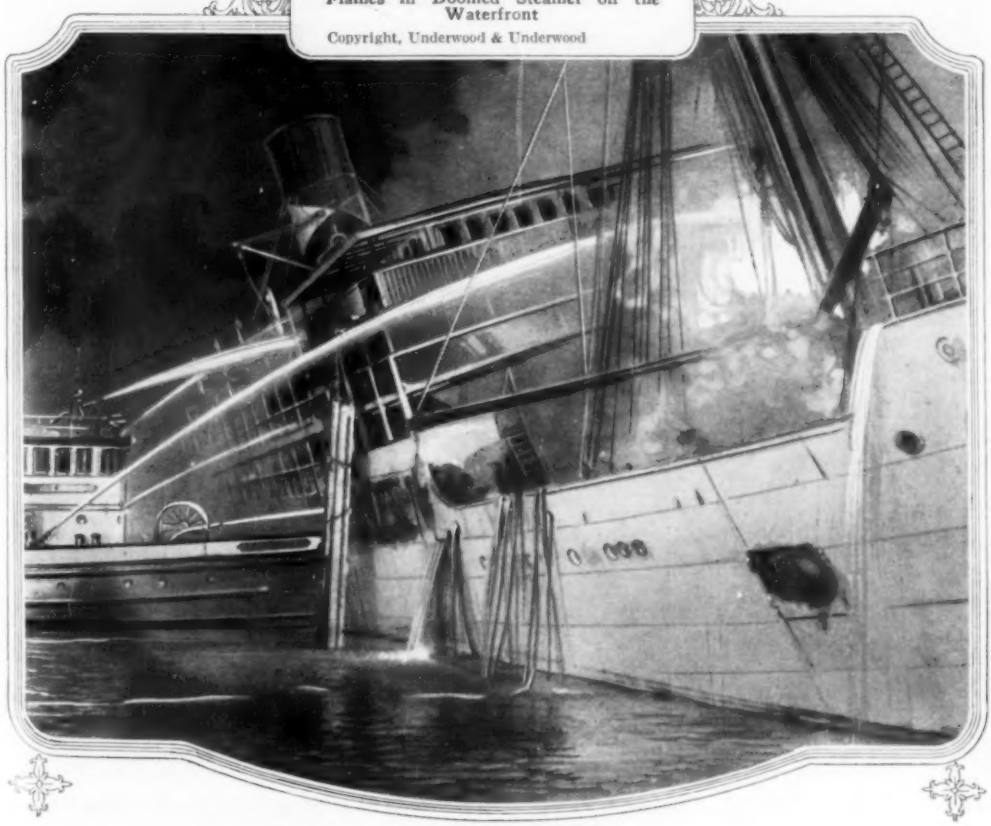
Motor-Driven Apparatus and Scientific Methods Answer Demand for Increased Efficiency Owing to Greater Hazards

FROM hand pumps worked by volunteers to the modern motor-driven fire apparatus is the record of considerably less than a century's progress in fire fighting. Steam-driven pumps did not begin to come into general use until the decade before the Civil War, and even then their advent was deeply resented by the volunteers, who protected their rights so devotedly that frequently the rival companies would let a fire burn while they fought among themselves. Chicago was a city of more than 90,000 population before it purchased its first steam pump in 1857. A fire chief of the time, in his memoirs, writes:

"In 1855, when we first started to agitate getting steam engines, the mayor appointed a committee to visit Cincinnati to see what they could do. We went down there and they got out their engines. But it was bad for them; they blew the steam chest off and killed the engineer, which put a damper on buying steam engines for the time. There was nothing done then for two years, when the council ordered 'Long John,' named after Mayor Wentworth." The engine was stored in what is now Chicago's loop, but the four-horse team which was hired to draw it was stabled nearly a mile away.

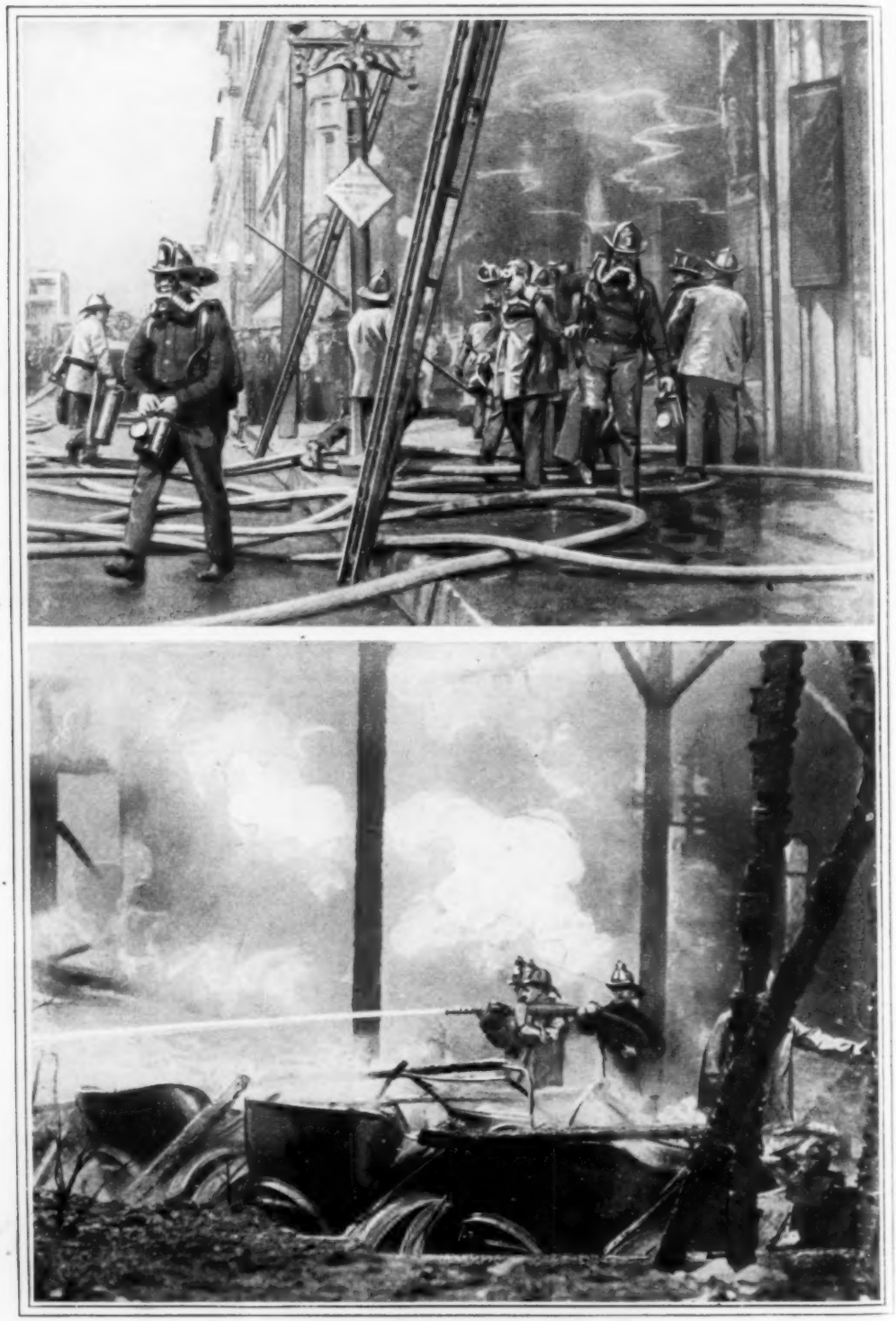
The fire-alarm system, typical of American cities of the day, consisted of a bell in the courthouse tower, and a watchman who hung out flags by day and lanterns by night to indicate in what part of the city the fire lay. That, however, was a great improvement on the system in vogue a few years earlier, when a church bell was used to signal a fire. An early account says:

"Anyone who first saw a building on fire ran to the church and pulled the rope which hung outside the belfry. In those days there was no gas, and torch lights were carried ahead of the engine by boys. When an alarm was rung at night citizens were instructed to place lighted candles in the windows of the stores or dwellings in

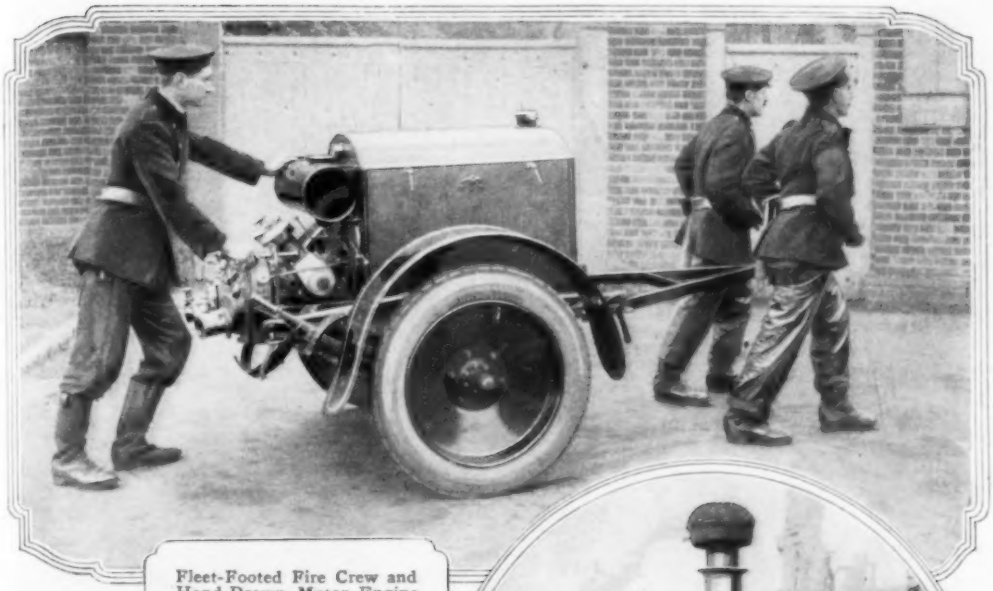


Fireboat Delivering Its "Broadside" during a Night Blaze; Below, Fighting Flames in Doomed Steamer off the Waterfront

Copyright, Underwood & Underwood



Defying Blasts of Flames Where Danger of Falling Walls and Roofs Is Forgotten in the Battle to Save Property; Above, Crew of Firemen Masked against Deadly Fumes and Smoke



Fleet-Footed Fire Crew and Hand-Drawn Motor Engine

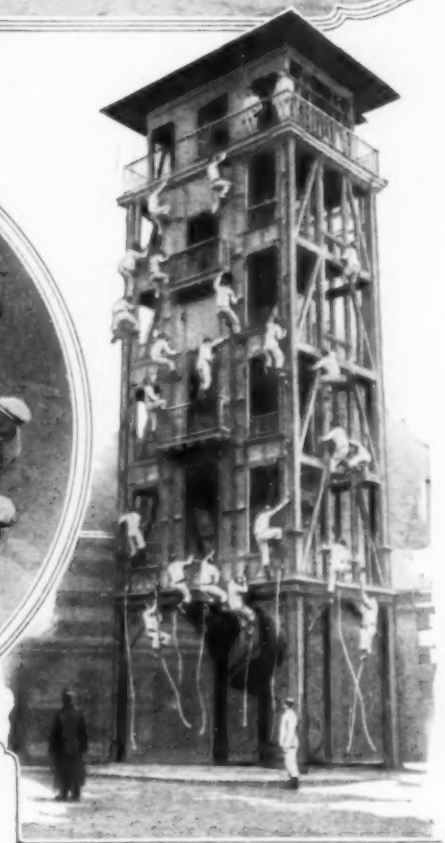
Fire Engine of the Type Used in Constantinople

Alarm Box for Sweden's Fire Fighters: a Lusty Blast on the Horn Sounds the Call for the Neighborhood Company

Part of Apparatus That Fought Great Fire at Smyrna

Trying Times for the Daring "Smoke-Eaters" Struggling against a Night Fire That Turned a Peaceful City Block into a Seething Furnace and Drove Hundreds from Their Homes

Motorcycle Patrol Whose Speedy Arrivals at Scenes of Fires often Stop Their Spread and Prevent Great Loss of Lives and Property



Life-Net Drill Held by School Boys Who Are Taught Rescue Work by Fire Instructors, and "Human Flies" of Paris Fire Force Exhibiting Skill in Climbing

order that the firemen might be lighted on their way."

The horse, which made its advent into fire fighting so inauspiciously in the middle of the last century, held its place, however, for more than fifty years. The motor truck, introduced originally as a tractor to haul the apparatus, has likewise sounded the death knell of the old steam engine, with its spectacular stream of flying sparks. Modern motor apparatus, besides being lighter and more economical in operation, also makes possible higher pressures and greater streams of water, necessary to fight fires in lofty skyscrapers.

The science of fire fighting also has received some radical changes during the last two years as a result of a study made by the fire underwriters of what is known as the Burlington building fire, which occurred in Chicago in 1922. The name is somewhat of a misnomer, as twelve buildings were involved in the fire and the Burlington building, while the heaviest individual loser, was not strictly speaking, a part of the original fire. Eleven of the buildings destroyed or badly damaged embraced a series of old brick structures from one to eight stories in height, most of them dating from the years immediately following the great Chicago fire of 1871. The Burlington building, home of the Chicago, Burlington and Quincy railroad, was a modern fifteen-story terra-cotta-faced office structure, a half block to the west of the other buildings and separated from them by a wide street.

Fire starting in the group of old buildings sent columns of flame and heated air 200 feet above their roofs, where the heat met a fresh breeze blowing across the top of the Chicago loop district buildings, and was deflected westward to the Burlington offices. So intense was the heat high above the ground that the wired-glass windows of the big office building melted, while the terra cotta itself was badly fused, though no flames had come in contact with it. The intense heat from the fire a half block away raised the temperature of the office furniture and other woodwork to the combustion point, and the entire upper floors of the Burlington building, from the ninth to the fifteenth, burst into flames.

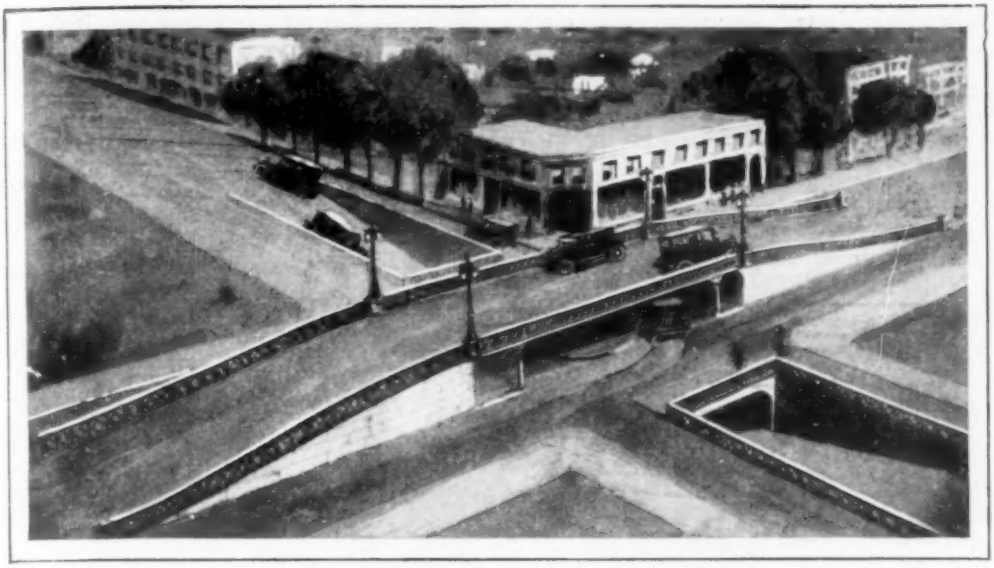
The lesson of the fire introduced a new element into fire fighting and may bring new arrangements to protect the exterior walls of tall buildings when exposed to the heat from fires in their smaller neighbors.

With all the improvements in fire fighting, the flames continue to take an enormous toll of life and property.

One thousand dollars' worth of property burns every minute, day and night, in the United States; forty lives are lost by fire each day; one dwelling house burns every four minutes; one farm building every seven minutes; one hospital each day; five school houses daily; five churches every day, and fifteen hotels in each twenty-four hours.

And so, despite the advancement of science, vigilance remains today the best protection against fire.

Crashing Walls and Flying Timbers Often Take Toll from the Ranks of Valiant "Knights of the Hose" Who Risk Their Lives to Stem the Tide of Fire



Copyright, A. T. Smith

Drawing of Triple-Deck Street-Crossing Plan for Safety and Congestion Relief; Subway and Upper Level Allow Uninterrupted Through Traffic While Middle Is Left Free for Turning

Triple-Deck Crossings to Protect Lives and Relieve Congestion

To relieve congestion and increase safety at crowded crossings, a Los Angeles engineer has designed a triple-deck street arrangement particularly for intersections outside the business districts, where the absence of traffic policemen and heavy high-speed travel are often a menace. In one direction, the highway passes through a subway while the cross street is elevated over it. The chief feature of the plan is a central deck which is exclusively for turning. This prevents slowing up through traffic in either direction, minimizes the likelihood of collisions and protects pedestrians, who cross only at this center level. The inventor claims that the plan can be adapted in business districts by eliminating the subway, elevating one of the cross streets and having ramps for turning on the upper deck. Cars can be parked beside the elevation.

Wash Fountain Serves Ten Persons at the Same Cost as One

Attractively designed, a wash fountain that accommodates several persons around it at the same time, has been designed for use in factories and shops, hotels and clubs, and similar places. Equipped at the top with either a liquid soap container or dish for cakes, it furnishes a spray of clean, fresh water which drains off the polished surfaces, carrying the dirt and suds away and keeping it sanitary with a minimum of care. When not being used, the water is shut off, and it is claimed that ten persons do not use any more than one would from a single faucet of the ordinary size. As fewer washstands are needed, floor space is also saved. With only one inlet and one drain, a multitude of pipes and fittings are displaced, reducing repairs and replacements, and as there is no stopper to hold the water in, it cannot overflow.

Washing in a Spray of C'ean, Fresh Water Emitted by Attractive Sanitary Fountain

Weather Vanes' Popularity Grows through Skill of Artists

Commonly used in medieval times, weather vanes have become increasingly popular in recent years because of their artistic possibilities and the novel and decorative touch they add to many types of modern architecture. Several studios manufacturing them employ highly skilled artists to draw the designs and cut the vanes from metal sheets. An eastern workman devotes his entire time to the making of these articles and his shop has become well known for its variety of patterns and the artistic quality of the product. Silhouettes of galleons with sails set as though plowing the seas, equestrian figures, processions of animals and other unusual designs are cleverly devised in metal and mounted on steel bars. From drawings on paper, the figures are marked on copper and brass sheets from two to nine feet long and are cut out with exacting skill. Great care is exercised to give the design perfect rigidity when mounted. Coloring and polishing enhance the appearance of the ornaments.

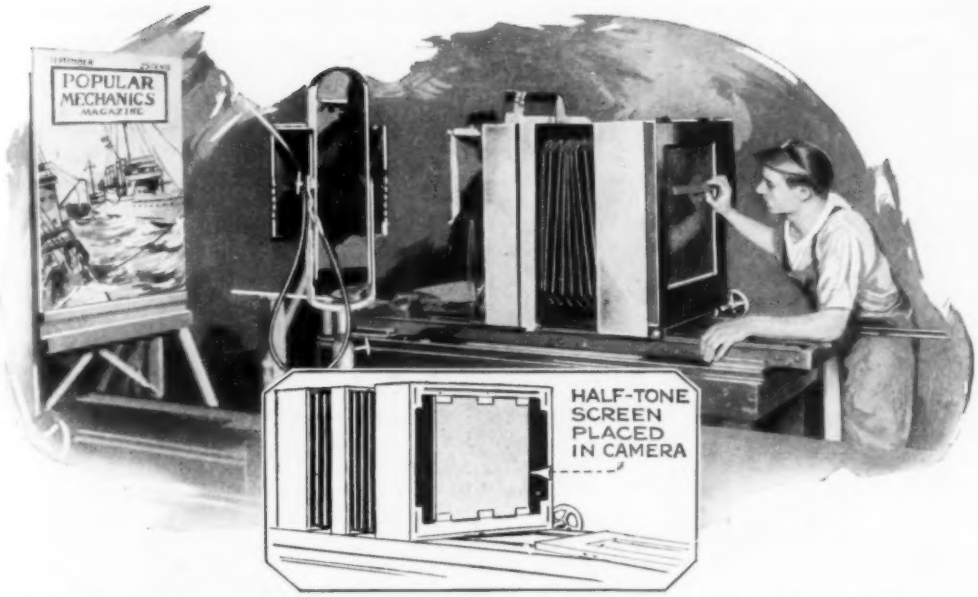
In the Weather-Vane Artist's Studio, Where Graceful Silhouettes Are Cut from Metal to Show Which Way the Wind Blows

Millions Saved for Diamond Miners as Result of Chance Discovery

Millions of dollars' worth of diamonds were saved to the world by a lump of grease dropped casually into a miner's pan in the Kimberley fields. It was this accident that resulted in the invention of a machine called a "pulsator," which picks diamonds out of material wherein they cannot be seen by the human eye. For years engineers had been seeking a method of saving the small gems which were being lost in the processes of hand sorting and washing because they could not be seen. Magnetic separating devices, sorting by electricity and other ways were tried without success. Then one day an old workman was oiling the bearings of the revolving arms in the washing pan when a lump of the lubricating grease slid from the flat stick and stuck to the bottom. A few days later, after the concentrates had been taken out and the muddy water drawn off as usual, a tiny diamond was found sticking to the black smear. Believing that he had stumbled onto the solution for the automatic separation of the precious gems, the workman reported his find to the engineer in charge. Experiments were carried out with a crude apparatus and water from a faucet. The diamonds stuck to the grease while pebbles and semiprecious stones rolled off. Thus came the discovery that there is some sort of affinity between the diamond and the grease, but the "why" is still a mystery.

Oxygen to Cure Sea Sickness

Oxygen has proved successful as a cure and preventive for sea sickness, according to statements made at a convention of the Gas Products association following a test. It was pointed out that the gas could be put in containers small enough to be carried in a suitcase.



Carefully Focusing the Camera to Get a Sharp Picture of the Object in the Right Size for the Half-Tone Negative Is the First Step in the Process

America Leading the World in Inventions

More Than $143,000 Offered for Ideas to Help Solve Nation's Problems and Maintain Present Supremacy

Copyrighted, 1924, Popular Mechanics Co.

WITH only about one-sixteenth of the population of the world, one-half of the world's patents have been issued in the United States.

In the past ten years one person in each one hundred and fifty has asked that a patent be granted on some device or other. Approximately 80,000 applications were filed last year and 40,000 patents granted.

American patents mean something too, for since 1836 the patent office has made a careful search of all available records before passing upon applications. Great Britain and Germany did not institute the search plan until comparatively recently and France does not search even yet. A patent in France therefore means only an assertion of priority.

Probably none of the first inventions affected this country more than that of the cotton gin. Eli Whitney was one of the thirteen children in his family, and it was in the shop where the older ones worked that he became skillful in the use of tools. He began by repairing fiddles, and did it so well that soon inhabitants of the whole countryside came to him. At the age of thirteen years, he made the first machine for manufacturing nails.

While in Georgia as a tutor, the mother of his pupils suggested that Whitney should try to invent a process for cleaning cotton. He could make or mend anything in the toy line, she knew from his demonstrations. At first he refused with the explanation that he did not know a cotton seed when he saw one, but later he was given a room where he could experiment. The model was completed in 1794 and was to be kept entirely away from the curious public until a patent could be obtained. Soon, however, the crowds about the house became uncontrollable and later the place was broken into and the result of all his efforts carried away. As a consequence, the planters began to use it without even a word of thanks, and it was not until 1800 that Whitney was able to obtain recognition. Then, in 1812, a renewal of his patent was refused and thus he failed to realize the amount to which his invention really entitled him.

While Whitney is one of the best known of American inventors, Walter Turner, who is credited with no less than 400 patents, the value of one of which has been set at $28,000,000, is one of the least known to the general public. Nevertheless, it is to the genius of Turner that we are indebted for marvels of transportation that would be impossible without the railway equipment devised or perfected by him.

Turner came from one of the quiet shires of England, and took up sheep herding in Wyoming. During the panic of 1893, he was obliged to sell his sheep and found work as a wheel tapper on the Santa Fe line. One day he went to the boss of the shops and said he believed he had an improvement for the air brake. The railway company took out a patent and increased Turner's pay. A little later, he devised further improvements and was put under contract.

His efforts attracted the attention of George Westinghouse who offered him a position in Pittsburgh, where more inventions came from his brain with remarkable regularity. The more he studied the air brake, the more he improved it. Westinghouse invented the air brake. His mechanism would hold a train of possibly fifty cars. Turner developed it so much further that now it is possible to control a train of one hundred or possibly 150 cars as easily as a train of ten cars.

All of which only goes to show that one of the first requisites for the solution of a problem is knowing what the problem is and that the lack of technical training need not be a handicap to the inventor.

It was to indicate clearly the industrial needs of the country as the first step toward their solution that Popular Mechanics Magazine obtained the co-operation of many of the nation's leading manufacturers. On the following pages you will find their problems clearly outlined with definite rewards offered for acceptable solutions.

HOW PHOTO-ENGRAVINGS ARE MADE

THOUGH practiced for generations, the art of photo-engraving with its magic power of reproducing realistic pictures on the printed page is still more or less of a mystery to the layman.

Beginning nearly a hundred years ago in the laboratory of a French scientist, Joseph Nicephore Niepce, who discovered a compound that became insoluble when exposed to light, amplified by the chance discoveries in chemical development by Daguerre and by the later experiments of Fox Talbot, who originated the process of breaking up the picture into little dots by photographing it through a fine-meshed screen, the art in recent years has developed to an amazing degree of perfection.

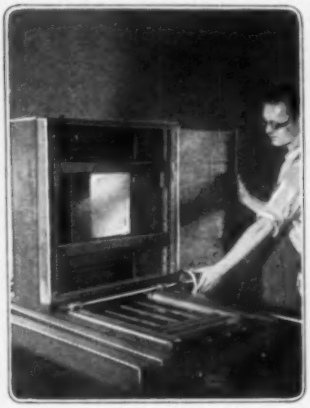
Briefly, it is the science of transferring a picture to a sheet of metal and then lowering all the area except the portions that are actually to touch the paper when the finished plate is placed in the printing press. Three main processes are essential. The picture must first be photographed to make a negative. It must then be transferred to the metal plate, and, finally, the copper or zinc sheet must be etched to leave only the lines and dots of the subject exposed to the ink.

A special camera and plate are employed to obtain the negative. The subject to be taken is fixed to a board and strong light directed upon it. The camera is then carefully focused so that, on the ground glass at the rear, the image will appear in the exact size desired for the finished plate. The glass is coated with a sensitized preparation and immersed in a silver bath before placing it in the camera. If a half-tone is to be made, the picture is taken through a fine-mesh screen made up of two pieces of ruled glass, glued together and with the lines at right angles so that the resulting impression on the negative will be broken up into a number of dots of different size to give the high lights and shadows. Then the negative is developed and dried. As the image appears in the reverse of the original, the film is stripped off, turned around and placed on another glass for printing upon the metal plate.

Sheets of copper or zinc of carefully measured thickness and special quality are used for the plates and the printing is done in a press which holds glass and metal closely together. From three to five minutes under strong light are generally sufficient to transfer the image from the glass to the plate which has been covered with a sensitized coating. The surface is then treated in such a way that only the lines and dots that are to appear on the paper are left protected while the rest of the coating is washed away.

Routing machines remove extra metal more rapidly than is possible by acid, and hand etchers carefully go over the plate to bring out contrasting lights to better advantage. After it has been lined and

One of the Dark-Room Processes; Submerging Coated Plate in Silver Bath



Sensitized Plate in Position in Camera behind Half-Tone Screen to Make the Dots

Examining Negative with Microscope for Dot Values Given by Half-Tone Screen

Completing Negative by Giving It Washing with Sodium Sulphide

Lifting Film from Negative Glass after Soaking It in Bath of Acetic Acid

Cutting Out Surplus from Plate Which Is Not Wanted in the Finished Engraving

Drying Coated Copper Plate by Whirling It over Gas Flame in Dark-Room Cabinet

beveled, it is placed upon a wooden block and is ready for the press.

Although the art has reached a remarkable degree of perfection, there are still problems to be solved, two of which are included among the following offers.

$5,000—Animated Drawings

In engineering, especially naval architecture, dealing in the design and sale of designs of fast yachts and boats, there is a high sales resistance. The same is true of all engineering projects, and is due not so much to lack of money to enter the field but to overcautiousness and bargain shopping. Verbal appeals do not picture results adequately. It has been found that working models are helpful in selling projects, but models are too expensive for their limited field of advertising contact. The potential clientele is therefore severely limited. The present and usual weak appeal consists of neatly rendered drawings, coupled with photographic samples of past successes, and adroit salesmanship. For a means of animated drawings for screen reproduction which will smoothly animate drawings and renderings without any element of cartoonishness, the donor agrees to arrange for the payment of royalties amounting to $5,000 within a year of the proven mechanical practicability of the invention, after which the donor is to pay for a controlling interest and is to be the sole licensee of the outstanding interest. While the present idea is to animate, bring to life in a realistic way, the proposed designs of yachts, ships and machinery, the field is not confined. Any suggestions will be witnessed by notaries with donor, and such leading to a solution will be generously rewarded.

$100—Ink Formula

In naval architects' offices, the designing of ships with multitudes of detailed parts necessitates the use of tracing sheets printed with border lines and title blocks or stamped with conventional notations. Frequently these blocks must be changed as to wording and so forth, necessitating erasing which, with present inks, ruins the tracing cloth with blotches, scratches and faint ink marks. These do not interfere with printing always, but are apt to spoil all the work gone before, and at best, result in a lack of crispness and finish to the work. For an ink that can be used in a regular printing machine or with a stamp, on tracing cloth, which will be thoroughly opaque, dry fast, erase with a flick of a knife point, donor will give $100 toward application of patent for same by entrant, or $100 in cash. There is a crying need in 40,000 drafting offices today for an ink like this to save time, work and money for the man with the ruling pen who has not yet been emancipated from the handicraft stage.

$100—Drafting Improvements

In any drafting room there is an enormous amount of time wasted in doing tasks that, for method, are relics of darker ages. For the best list of salient and glaring faults which are now standard practice in drafting procedure, between the time the drawing is started and the last tracing made, the donor will pay the sum of $100. Opposed to the faults should be recommended a remedy for each. Receipt of lists will be witnessed by a notary; all lists will be copied, returned as witnessed, and a mimeographed circular sent to all entrants. The foregoing three offers close May 1, 1925. Address Problem NA-1.

$20,000—Static Eliminator

The National Company, Incorporated, makers of the "Perfect Vernier Condenser" and velvet vernier dials, offer to pay the sum of $10,000 in percentage from sales profits for either of the following devices that will meet the approval of this company, who are to be sole judge of whether or not the said devices are acceptable to them:

A satisfactory static or interference eliminator, for work in conjunction with a radio-receiving set that can be manufactured on a commercial basis and sold at a nominal price, and,

A highly efficient fixed condenser of small size and large capacity with a rupturing voltage of at least 750 volts maximum. Said condenser to be entirely different from any other device of this nature now in use.

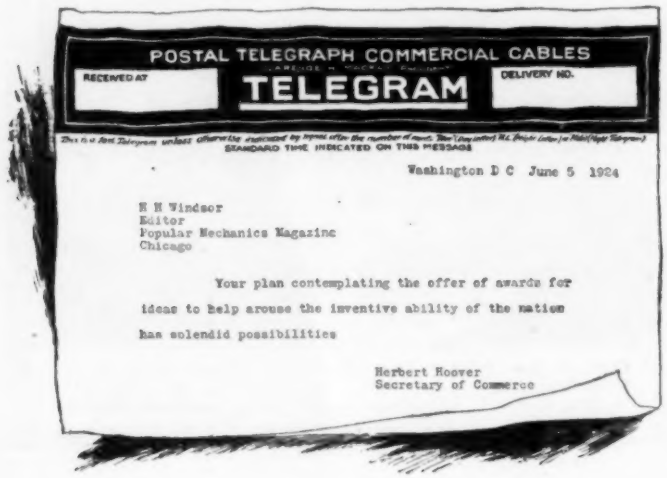
On acceptance by the National Company, of one or both of the above devices, an arrangement will be made with the inventor whereby a percentage of profits derived from the sales of same will be paid until such percentage aggregates the sum of $10,000 for each device. This offer expires May 1, 1925. Models or drawings may be submitted, but in either case return postage must be included. Address, The National Company, Incorporated, Cambridge, 39, Massachusetts.

$5,000—New Product for Manufacture

The Wollensak Optical Company of Rochester, N. Y., manufacturers of photographic lenses and shutters and makers of the Bioscope pocket binocular and Pockescope pocket telescope, are receptive to any suggestions for new merchandise which could most logically be offered for sale by dealers who are now handling their products. This concern would be most interested in suggestions for merchandise that could be sold through optical, photographic or sporting-goods stores.

They would only be interested in a product which could be handled to advantage by their present equipment. They are equipped to manufacture any sort of optical unit or any kind of small mechanical job involving the use of screw machines, presses and customary machine-shop equipment. For any such product as will prove acceptable to them, they will enter into a royalty agreement with the inventor or the one who offers the suggestion, awarding royalties until such time as the sum total of the royalties amounts to $5,000, or a flat sum, agreeable to both parties, may be arranged.

No Wollensak employe nor any member of their families will be entitled to submit suggestions in this offer. The suggestion can be offered in the form of a drawing with complete description, in the form of a written suggestion or as a working model. This offer ends July 1, 1925. Address all entries to Wollensak Optical Company, 1415 Clinton Ave., Rochester, N. Y.



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R H Windsor
Editor
Popular Mechanics Magazine
Chicago

Your plan contemplating the offer of awards for ideas to help arouse the inventive ability of the nation has splendid possibilities

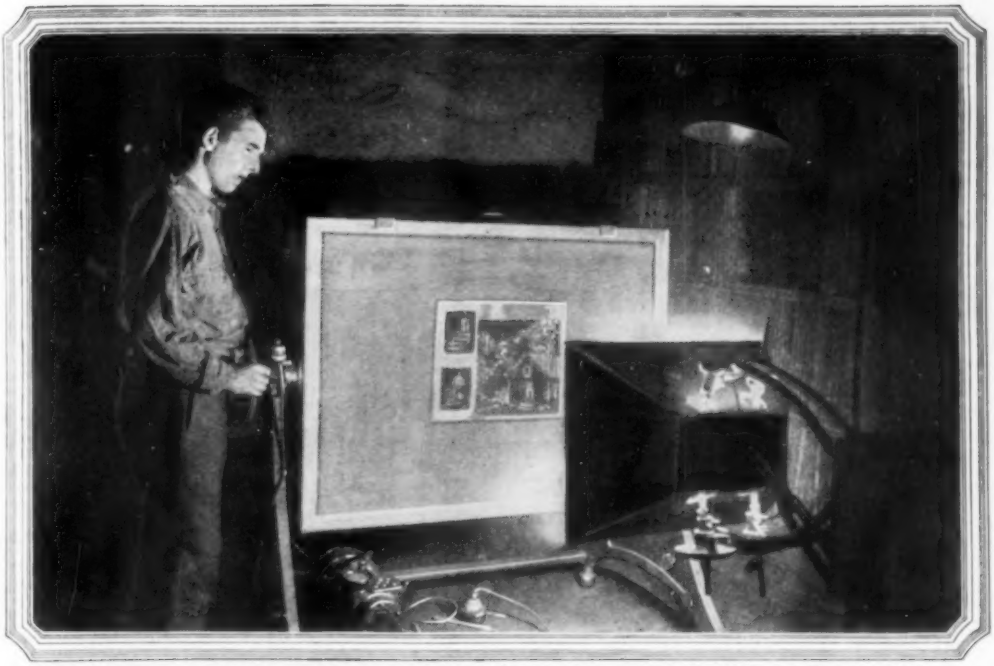
Herbert Hoover
Secretary of Commerce

$1,000—Process for Hard-Glossed Candies

The Happiness Candy Stores, Incorporated, will pay the sum of $1,000 for the exclusive rights to a formula or method of manufacturing hard-glossed candies which will not impair in any way either the appearance or eating qualities of the candy, but will prevent it becoming sticky or losing its gloss when exposed to humid atmospheric conditions.

$1,000—Non-Discoloring Chocolate

The sum of $1,000 will be paid by the Happiness Candy Stores, Incorporated, for the exclusive



Printing the Photographic Impression upon Sensitized Copper Plate through the Negative Superimposed upon It and Exposed to Rays of Powerful Battery of Electric Lights

rights to a formula or method of manufacturing chocolate coating which will not impair either the appearance or eating qualities of the same, but will prevent it from turning gray or dull when exposed to atmospheric conditions. The above two awards or any one of them will be paid only if and when a sufficient trial of the formulas or methods submitted has proved them to be in every respect satisfactory and acceptable to Happiness Candy Stores, Incorporated, and that their use will neither violate any pure-food laws nor infringe upon the rights of anyone, of all of which the Happiness Candy Stores, Incorporated, will be the sole judge. The offers expire May 1, 1925. Address Happiness Candy Stores, Incorporated, 202 Harris Avenue, Long Island City, New York.

$5,000—Hoist for Dump Trucks

The Continental Car Company of America will undertake the manufacture and marketing of an original design hoist for dump bodies operated by motor vehicle, said hoist to be operated from the driver's seat by power from the engine. This invention or improvement must be different from devices now in use for such purposes, must be simple in construction, inexpensive to build and efficient. It must do the work of a hoist satisfactory to our engineering department, and it must be acceptable to our distributors located in the principal cities throughout the United States. This hoist must be so designed that it can be used, by increasing the size of the parts, for dumping bodies of from one-ton to five-ton capacity. To the inventor of such a hoist which meets the approval of our engineering department, the donor offers the following proposition: The donor will enter into a contract to make and sell these hoists in connection with their truck bodies and will pay the inventor royalties, if a basic patent on the hoist is secured, aggregating the sum of $5,000, in the following manner—royalties are to be paid the inventor in amount not to exceed one per cent of the net sales price of the complete body and hoist when and as the bodies and hoists are sold, until the full amount of the $5,000 has been paid to the inventor, at which time payments shall cease and the invention or improvement becomes the sole property of the Continental Car Company of America, Inc., or its assigns. A working model of the hoist should be submitted so our engineering department can judge of its value. Written descriptions, drawings, sketches, etc., will receive consideration but we prefer to have a workable model.

$1,000—Article of Furniture

This concern also will pay the sum of $1,000 in an arrangement similar to that above outlined, for a new toy for a child, or a new useful article of household furniture made principally of wood parts formed from the lumber offal from manufacture of wooden truck bodies. We prefer that this article be something of use in connection with radio that would prove to be an attractive accessory to the public. This firm will be the sole judge of the article's merits.

$5,000—Air Car-Dumping

For air-dumping equipment which meets with the approval of the Continental Car Company of America's engineers—and to meet with their approval, among other things, the dumping equipment must not only dump the car but right it to a horizontal position and lock it—the donor agrees to pay the inventor the sum of $5,000, provided a basic patent can be secured, in the following manner: The donor is to pay a royalty of $50 on each and every car sold with this equipment installed thereon when and as the cars are sold, until the full sum of $5,000 in royalties has been paid to the inventor, at which time payment of royalties shall cease and the invention is to become the sole property of the Continental Car Company of America, Inc., or its assigns. If the dumping device is not patentable, but in the opinion of the donor is new and useful and is used by the donor, then a smaller amount is to be paid to the entrant, said amount to be fixed by the directors of the Continental Car Company of America. Detail drawings may be submitted to the donor instead of a model. In operating the projected car, it must be so designed as to dump on either side of a track and the act of dumping is to be accomplished with compressed air furnished by the locomotive and operated by the engineer from the cab.

No individual connected in any way with the Continental Car Company of America may participate in these offers, all of which will terminate May 1, 1925, unless extended by special arrangement between donor and any entrants. Address, Continental Car Company of America, Louisville, Kentucky.

$1,000—Cost Reduction

This concern makes the Kirstin Fil-Gage for filling Ford automobile gasoline tanks under the seat without

need of removing the cushions. It has an indicating gauge in plain sight of the driver at all times and is attached to the tank opening in place of the cap. The Fil-Gage is made of black-finished sheet metal. Our factory operates in large production, and for any accepted improvements not yet tried out or developed which will increase the efficiency of this filler and gauge and decrease manufacturing costs, we will pay the sum of $1,000. Or, we will pay this amount for any suggested changes, satisfactory to us which will reduce the production cost 20 cents on each article. No theoretical suggestions will be considered. To qualify, entrants must have actually tried their improvements in operation on one of the devices and have proved it practical and workable. The Fil-Gage containing the improvement must be sent to us by registered mail for testing and upon acceptance and the assigning to us of patentable rights, we shall pay the amount stated to the entrant whose ideas we adopt. This offer expires May 1, 1925. Address, A. J. Kirstin, General Manager, A. J. Kirstin Company, Kirstin Bldg., Escanaba, Michigan.

$5,000—Leather Scrap Uses

This concern, the Eisendrath Glove Company, wants a new method whereby the scrap leather in our glove factory can be profitably utilized. Over thirty per cent of the leather, horsehide, cowhide, sheepskin, etc., that we cut is lost in scraps. Is there an automobile floorboard, composition floor covering or fabric capable of being developed from these waste pieces? The acceptable plan, process or method of some profitable utilization of this waste material is worth $5,000 to us. We will pay this sum in cash to the person submitting the solution of this problem which we adopt. All ideas and suggestions are subject to the judgment of this firm alone. Our offer expires May 1, 1925. Address, Eisendrath Glove Company, 2001 Elston Avenue, Chicago, Illinois.

$200—Best New Use for Slate

In line with the efforts of the National Slate Association to promote and extend the uses of slate as illustrated by their slogan, "Slate—Consider Its Uses," the association will pay the sum of $200 for the best suggested new use received before May 1, 1925, the date of expiration of this offer. In addition to the above offer, cash payments in proportion to their value to our members in the industry, will be given for all suggestions having reference to the production, distribution, and use of slate and slate products, not already known to our members, and which they adopt. Address, National Slate Association, 761 Drexel Building, Philadelphia, Pennsylvania.

Tooling and Finishing Plate by Hand Removes Rough Edges and Secures Contrasting High Lights

$50—New Use for Ground Slate

Owing to the tremendous use of crushed and ground slate in various construction and industrial processes, the Parsons Manufacturing Company is interested in extending such uses and will pay the sum of $50 for the best suggested new use for ground slate received before May 1, 1925, the date of expiration of these offers. In addition to the above award, cash payments in proportion to their value will be given for all suggestions having reference to the production, distribution and use of crushed and ground slate not already known to us, and which we will adopt. Address, Parsons Manufacturing Company, Pen Argyl, Pennsylvania.

$500—Uses for Generators

For three new uses for low-voltage generators, 2-10 volts, besides plating, electrotyping, and battery charging, that will produce $50,000 additional sales volume to this concern, through such new uses, William H. Mitchell Company will pay the sum of $500, one-fourth of the amount at the time we adopt the suggestions, and the balance in three equal payments, one every three months until full amount is paid.

$500—Motor Generator Set

For a simple design of 2-kw. motor-generator set (or rotary converter) in which the single-phase synchronous motor obtains excitation from the 6-volt generator it drives, and one which is accepted by this concern, we will pay the sum of $500. The outfit must have good starting torque and unity power-factor characteristics. These two offers will close on May 1, 1925. Address, William H. Mitchell Company, Troy, Ohio.

$500—Anti-Freezing Ingredient

We have an emulsified asphaltic concrete which consists of 70 per cent petroleum asphalt of from 90 to 110 penetration and a 30 per cent water and soap solution. The addition of alcohol would keep the material from freezing out in the cold weather but would be highly expensive and the ingredient used for this purpose must not add more than 1 per cent to the present cost of the product. We will pay the sum of $500 to the person who can give us an acceptable and satisfactory formula, process, ingredient, or method by which the freezing out of the emulsion can be prevented in cold weather. This offer expires May 1, 1925. Address, S. D. Hofheimer, Land Title Building, Philadelphia, Pennsylvania.

$500—Gasoline Mower

The Granite State Mowing Machine Company will pay the sum of $250 in cash and $2.50 each royalty on the first one hundred machines sold for satisfactory working drawings of a gasoline motor lawn mower which we accept for manufacture and sale. This must be a practical walking type motor-driven lawn mower, 20 inches or 24 inches cut, with a simple compact power unit such as the small motors made by Briggs and Stratton Company, Milwaukee, Wis., that will drive and operate a lawn mower about the size and type of the ordinary 20-inch hand lawn mower, and that will be suitable for general use and can be manufactured complete for $50 or less. Motor must propel both mower and cutter and operator must be required only to guide mower. This organization will be the sole judges in reaching a decision regarding the worth of the design to us. Our offer ends May 1, 1925. Address, Granite State Mowing Machine Company, Hinsdale, New Hampshire.

$300—Sheet-Metal Key Guide

We make a key guide surrounded by an oval escutcheon plate. The oval plate is made of .035-inch sheet metal and the key guide is a die-cast article. Our plan is to design a key guide of sheet metal that will properly fit the oval plate or one of similar form. The guide is inserted through the center of the escutcheon and protrudes beyond it. For a satisfactory arrangement that will be as cheap as the die-cast guide we now use, and one that we accept, the National Brass Company will pay the sum of $300. This offer ends May 1, 1925. Address, National Brass Company, Grand Rapids, Michigan.

$1,000—Improvements to Lathes

In four awards of $500, $250, $150, and $100. These awards will be paid for the four best ideas for

After Copper Plate Is Printed, It Is Etched in Machine Where It Is Sprayed with Acid Bath to Produce the Relief Surface Necessary for Impression on Paper

new and practical attachments for a screw-cutting engine lathe. The mechanical application and the idea must, of course, be heretofore untried and original and may consist of a distinct improvement on an attachment now in use or a direct improvement on any part of a screw-cutting engine lathe. Value and merit of improvements or suggestions will govern the order in which the allotments of the four awards will be made. The offer expires May 1, 1925. Address all suggestions to South Bend Lathe Works, 423 East Madison Street, South Bend, Indiana.

$500—Anti-Carbon in Oil Burner

The Aeroil Burner Company will pay the sum of $500 in cash to the person who develops for them a practical inexpensive means by which carbonization can be prevented in portable oil burners of the vaporizing type such as we manufacture. Such a method may consist of different construction from that we now employ; a change in the design or the use of another kind of metal. The process may also include or consist of the use of an inexpensive chemical which could be mixed with kerosene. Whatever the plan, if it can prevent carbonization in our oil burners and we accept the process after it passes our tests, we will pay the amount stipulated herein. This offer expires May 1, 1925. Address, Aeroil Burner Company, 266 Hudson Avenue, Union Hill, New Jersey.

$10—One-Dip Enamel

For a white enamel which will satisfactorily cover black sheet steel in one application by the dipping process the Patent Novelty Company will pay the sum of $10 in cash. The material will be subject to trial by our own organization before adoption. The offer ends May 1, 1925. Address, Patent Novelty Company, Fulton, Illinois.

Many Additional Offers Will Appear in the OCTOBER ISSUE

OFFERS ANNOUNCED IN PREVIOUS ISSUES

All of These Offers Expire May 1, 1925

NO. 1—THE YELLOW CAB MANUFACTURing Company offers an award of $50,000 for a perfected plan of traffic and pedestrian correction and regulation, including mechanical devices, regulations, etc., for the promotion of greater street safety.

NO. 2—$10,000 FOR A NEW MUSICAL INstrument which can be incorporated in any orchestra or brass band and will take a place among the present family of musical instruments accepted by the rank of players. Lyon and Healy, Inc.

NO. 3—FOR THE BEST SUGGESTED IMprovement on a gasoline-heated blowtorch and soldering and branding iron combined, an award of $500 will be paid by the Everhot Manufacturing Company.

NO. 3A—$200 WILL BE PAID BY THE ABOVE concern for the best suggested new use for the device named in Problem 3. Other cash awards in proportion.

NO. 4—PROCESS BY WHICH ZINC THAT oxidizes and is lost in brass foundries can be saved and used. Award $500.

NO. 4A—PLAN BY WHICH LEATHER wasted in making of belting, etc., can be disposed of at profit to manufacturer. Award $100.

NO. 5—AWARDS OF $500 EACH WILL BE paid for a waterproofing process for a library paste and a method that will produce increased sales of this product. John J. Harris and Company.

NO. 6—FOR PRACTICAL METHOD OF anchoring electric light clusters to vases, urns, etc., to convert them into lamp stands, $250.

NO. 6A—FOR MOST WORKABLE PLAN whereby such lamps can be made from material found in shops of electrical contractors and dealers, $150.

NO. 6B—BEST SALES SCHEME WHICH WILL promote business of making lamp stands for dealers, $100. Above three problems by Benjamin Electric Mfg. Company.

NO. 7—WHAT CAN BE MANUFACTURED BY plant specializing in making bicycle wheel rims? Award $5,000.

NO. 8—IDEAS SUGGESTING NOVEL, PRACtical and valuable uses for Ilg ventilating fans, blowers and unit heaters. Proportionate awards aggregating a total of $5,000 will be paid by Ilg Electric Ventilating Company.

NO. 9—FOR A SOLUTION OR METHOD which will eliminate "dry effect" that occurs in the process of photo-engraving the sum of $500 will be paid.

NO. 9A—PERFECT IMPROVEMENT IN COLor separation process used by photo-engravers, $500.

NO. 9B—PLAN BY WHICH A PERFECT etching could be made by a one-depth "bite" of etching acids reducing costs of this kind of engraving, $500. Above three problems by Jahn and Ollier Engraving Company.

NO. 10—ELECTRIC HEATING ELEMENT which will operate and interchange with base and cover of Imperial self-heating gasoline iron, $500. Imperial Brass Company.

NO. 11—$100 FOR PLAN OF PROFITABLY disposing of chamois skin scraps. Bassick Manufacturing Company.

NO. 12—DISCOVERY OF NEW USES FOR carbon-dioxide gas or improvements to prese. c uses. Award $1,000.

NO. 12A—FOR AN AUTOMATIC FREEZEproof soda cooler adaptable to "iceless" type of soda fountains, $1,000. Above two problems by Liquid Carbonic Company.

NO. 13—$2,000 WILL BE PAID IN SEVERAL awards for processes and machines for salvaging waste lumber. National Lumber Manufacturers' Association.

NOS. 14, 14A, 14B—FOR SKYROCKET STICK harmless in descent, $1,000; bombshell with illuminated flag, $250; chemical combinations to produce smokeless fireworks colors, $250. Thearle-Duffield Fireworks Company.

NO. 15—MOTOR-OPERATED HANDSAW FOR manufacture and sales; award, $10,000 in royalties. R. L. Barker and Company.

NO. 16—$500 FOR SALES PROMOTION PLAN for absorbent, non-heat-conducting powder that can be used with other materials. The Keasby and Mattison Company.

NO. 17—ROYALTIES OF $15,000 WILL BE paid by the Aetna Industries, Incorporated, for improvements in their products or new articles they accept for manufacture and sales.

NO. 18—THE GEMCO MANUFACTURING Company will pay $250 for suitable article they can make in their general metal-working plant.

NO. 19—$25 WILL BE PAID FOR A SATISfactory means of making cast iron leakproof against kerosene by the donor represented by Problem SC-1.

NO. 20—FOR A PROCESS WHICH WILL make silver untarnishable and will not impair its value the Stieff Company will pay $1,000.

NO. 21—BUESCHER BAND INSTRUMENT Company will pay the sum of $1,000 for successful saxophone reed of materials other than those now used.

NO. 22—FOR AN IMPROVEMENT OVER present device for closing collapsible rubber nursing bottle Dr. Goddard Nurser Co., Inc., will pay $1,000.

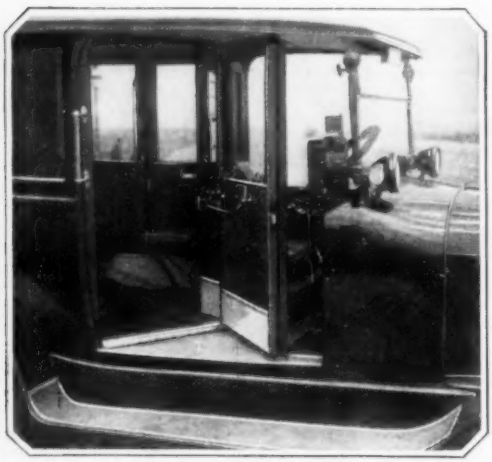
NO. 23—FOR A NEW FORM OF VARIABLE condenser for radio reception the Phenix Radio Corporation will pay $1,000.

NO. 24—WODACK ELECTRIC TOOL CORPOration will pay a sum of $500 for a satisfactory hammer arrangement for a portable electric hammer.

NO. 25—FOR NEW IDEAS OR IMPROVEments in present articles they manufacture of rubber, rubber and fabric or rubberized fabric, the Continental Rubber Company will pay $2,500 in royalties.

NO. 26—$100 WILL BE PAID FOR AN ACcepted design of starting switch for alternating-current motors by the donor represented by Problem PD-1.

Full Details Regarding the Previous Offers Listed Above and Numbered from One to Twenty-Six, May Be Obtained by Addressing the Bureau of Information, Popular Mechanics Magazine.



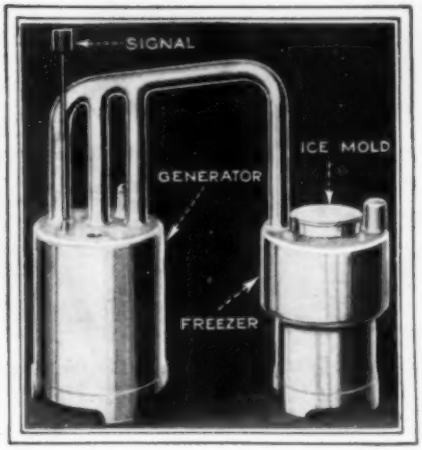
Taxicab of the Front-Door Design, Showing Interior

Taxicab with Built-In Front Door Increases Ease and Safety

Designed with a single front door instead of the usual two on the side, a taxicab which is planned to insure greater safety and more comfort and convenience both to the passengers and chauffeur has been adopted by a mid-western cab company. Set at an angle, the door is within easy reach so that the driver does not have to leave his seat to release the latch, and the passenger, before getting out of the cab, can pay the fare through an aperture in the glass. Absence of swinging doors is intended to decrease the likelihood of accidents, there is less difficulty in loading bulky packages and the wide opening toward the front permits better ventilation.

Ice-Making Machine for Tourists Works over Camp Fire

Having no moving parts, a small machine designed for making ice on automobile camping and touring trips, has been placed on the market. It consists of two cylinders, one a generator and the other a freezer, connected by a metal tube that also serves as a handle. The generator is heated on a kitchen range, gas flame or over a log camp fire, a sliding signal moving up and down when the refrigerant is driven to the receiver or freezer. The generator is then immersed in water or cooled by coils. It now acts as an absorber, a partial vacuum being created in the generator which causes the refrigerant to be sucked back from the freezer into the absorber. The machine is sealed and welded so that the vacuum is maintained and the refrigerant sealed in the chamber. Larger models that cool ice chests are worked on the same principle. Because there are no valves, gauges or other moving parts to cause trouble and no power, refilling or charging is necessary, it is claimed that the device can be operated in any place at small cost.



Above, Ice-Making Machine for Operating with Electricity; Below, Closeup

"Gas-Concrete" Is Made for Sawing, Planing and Nailing

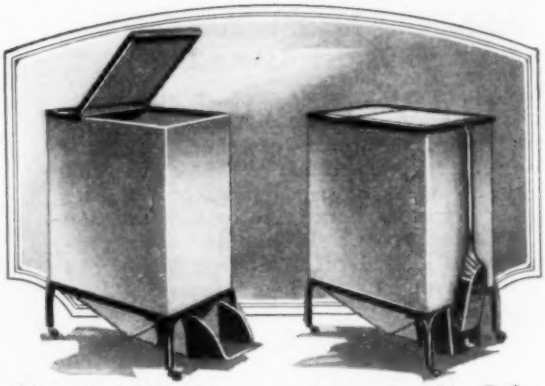
Light concrete that can be sawed, planed and nailed has been developed by a Swedish architect. It is made with cement and shale lime, together with a small amount of aluminum or zinc powder, which develops hydrogen when water is added, making the concrete porous. When set, it weighs forty to fifty pounds per cubic foot, or about one-third as much as ordinary concrete. The material is resistant to weather and fire in satisfactory degree for use in walls but not in chimneys, and has been approved by the building authorities of Stockholm for one and two-story dwellings.

Sugar in Water Adds to Life and Beauty of Cut Flowers

Sugar solutions of varying strengths are being used by a French florist in preserving cut blooms. Except in the cases of lilacs, sweet peas and lilies, practically all well-known flowers are said to be susceptible to the treatment, although the former, it is claimed, will respond to it by improving in tint and living longer if a trace of manganese sulphate is added to a twelve-per-cent solution. Carnations are declared to last twice as long with fifteen per cent sugar, while roses require only half that amount.

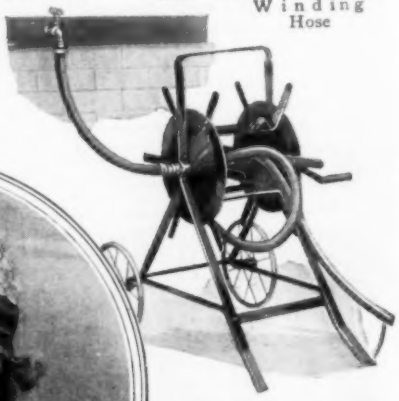
Time and Money-Saving Tools

Slipped On or Off in a Jiffy, the Waterproof, Stringless Apron Above Has No Buttons or Hooks to Catch or Come Loose and Effectively Covers the Dress



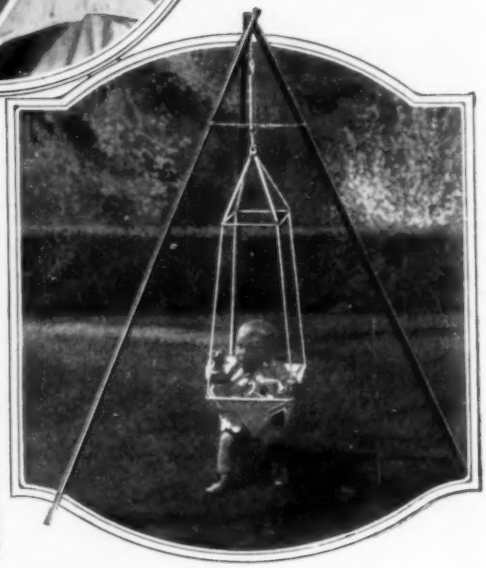
Where Coal Ranges Are Used, the Neat Fuel Box Shown Above, Eliminates Dust and Lifting of Heavy Scuttle

Below, Portable Reel with Crank Simplifies Winding Hose



For Bobbed Hair and Other Coiffures, a Snugly Fitting Bandeau Net in Fiber Silk Is Practical for Outdoor Wear

Suspended from Tripod, an Adjustable Folding Swing from Which the Baby Cannot Fall May Be Set Up in a Few Moments

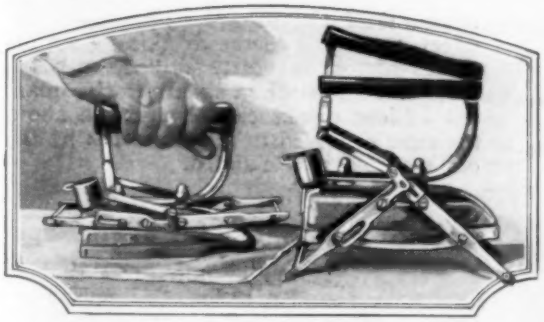


Rubber Washboard to Ease Laundry Days

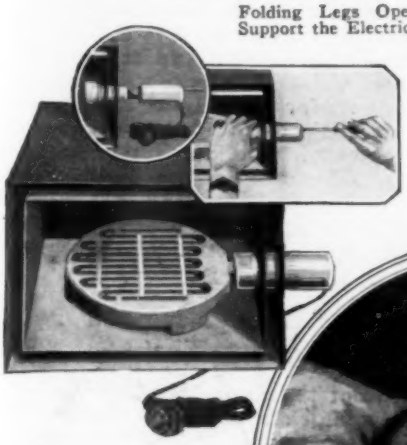
Smooth Edges That Will Not Cut the Hands Are Left by This Can Opener with Ratchet Wheel; Fits All Sizes of Cans and Works Easily

Anyone wishing further information on devices described in the editorial pages can

for Woman's Workshop in Home

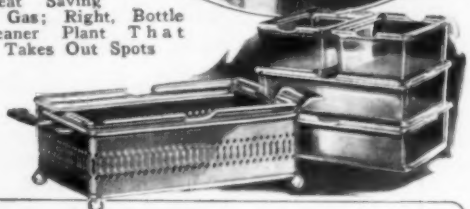


Folding Legs Operated by Grip Support the Electric Iron When It Is Set Down to Prevent Burns and Scorching; Below Is a Handy Heater That Converts Any Oven into an Electric Cooker



Waxing Floors Is Simpler Task with Canvas Bag Weighted with Shot Which Holds Polishing Pad Firmly to Boards; May Be Operated with One Hand and Reaches under Radiators and Low Furniture

Easily Attached to the Buggy or Crib, This Nursing-Bottle Holder Saves Both Mother and Infant Trouble at Feeding Times, Prevents Breakages and Holds the Robe



Square Saucepans, Invented by a Woman, Permit Cooking Four Articles at Once over One Burner and Great Saving in Gas; Right, Bottle Cleaner Plant That Takes Out Spots

Space-Saving Glass Dishes for Cooking or Storing Foods in Ice Box, and Attractive Holder for Table Service

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago

Beet Digger and Topper Saves Time and Reduces Cost of Harvest

Attached directly to the tractor, a farm implement that tops, digs and cleans beets, and piles them in the field, has been devised to save the grower's time and cut the cost of harvesting the crop. Power is supplied by a chain leading from the tractor's belt-pulley shaft, and the digger is supported in the rear by a single caster wheel. As the tractor is driven down the field, two revolving augers with digger points lift the beets, which have been topped by a bell-shaped disk on the other side of the machine, out of the ground. Digger and topper are controlled with levers by one man and work independently of each other on adjoining rows. As the beets travel to the hopper from which they are dumped upon the ground, they are cleaned by the revolving augers.

Beet Harvester in Operation behind Tractor Showing One of the Revolving Augers and the Hopper

Glass Tubes Cool Drinks Quickly by the Use of Chemicals

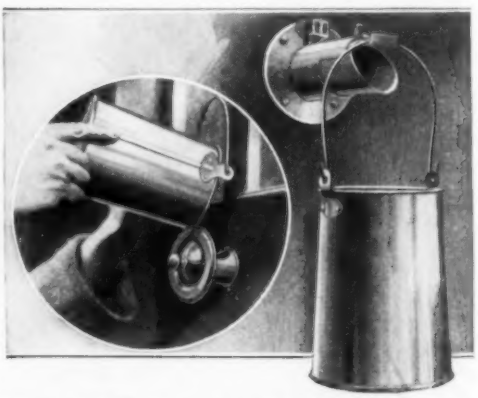
Claimed to cool drinks in hot weather, a system has been devised by a European inventor to do away with ice. A large number of glass tubes are attached to a machine and filled with a preparation of nitrate of ammonia salts and water. After being corked tightly the outer walls of the tubes are cleansed and wiped dry. To cool the drinks, one of the tubes is then inserted in each glass and agitated by electricity until the salts are dissolved. In effect, the liquid in the drinking glass becomes almost instantly chilled, with the result that more than six times the quantity of iced drinks can be made in about the time occupied to ice one drink by the old method, it is claimed.

Colored Aluminum for Wall Paper

Specially treated aluminum is said to have been found practical as a substitute for wall paper, decorative panels, covering for automobile bodies and many other purposes. The material, it is declared, is proof against corrosion and at the same time holds colors indefinitely. Prepared in thin sheets for covering walls and ceilings, it is claimed that "repapering" will be necessary only at long intervals, and as water will not harm the designs, the aluminum can be kept clean. It is said that the same process will protect tubes of aluminum from the action of sea water.

Milk Poured through Hole in Door to Prevent Thefts

To prevent the theft of milk from the doorstep, a knob and spout for pouring the liquid into a pail hung securely on the inside of the door are being made in England. The delivery man simply pulls out the knob and empties his bucket into a little trough exposed in an opening through the panel. The knob is put back and the filled pail is removed at the purchaser's convenience. This eliminates the use of breakable bottles and keeps the milk from exposure to extremes of temperature and flying dirt.



When Knob Is Drawn Out, Milk Is Poured into Pail through Door Spout

Fire Nozzles on Top of Skyscraper Protect Outside of Building

In testing the strength of standpipes of the thirty-two-story Straus building in Chicago, firemen attached powerful engines to the inlets at the street level and exerted tremendous water pressures on the interior system. The discharge flow, measured at nozzles on the roof of the structure, 495 feet above ground, attained a volume of about 1,000 gallons a minute. Although the building's fire-fighting equipment is designed to combat blazes occurring within, flames in near-by areas could be fought from the higher floors by attaching hose lines to the stationary nozzles. Pumps in the basement of the structure, operated by a 200-horsepower motor, begin to work when the pressure at any point in the system falls below fifty pounds.

Fireman Measuring Flow of Water from the Nozzle of a Skyscraper's Standpipe System; Left, Arrow Points to Tower Where Hose Outlet Is Installed

Heat That Melts Steel Like Butter Is Measured by Electricity

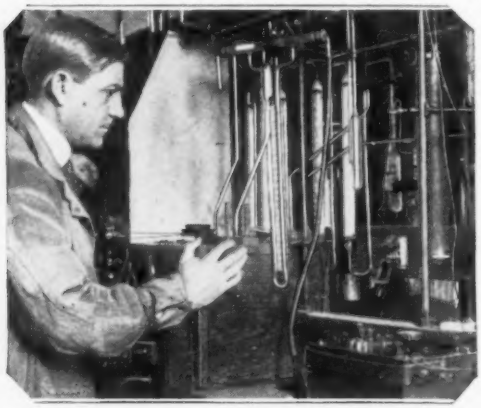
So tough that it will resist the heat in an electric furnace hot enough to cause a bar of steel to melt like butter, and yet so delicate that it will register this temperature to the accuracy of one degree, an instrument has been perfected for the metal-making industry. Two wires of different material are wound around each other at one end. This is known as a thermocouple. When exposed to heat, an electric current is generated which records the temperature. Another invention, at the same laboratory, measures electrically the gases in boiler flues to test the efficiency of various kinds of fuel. A third enables aerial navigators to tell just how fast gas escapes from the big dirigibles when emptying the bag for storage.

Beads Easily Picked Up by Needle Passing through Stringer

Beads may be strung quickly and easily with a device made for home and shop use. A square metal holder is clamped to the edge of a table, desk or chair and filled with beads. Blotting paper or cloth may be used to prevent it from touching polished furniture. A needle is inserted at the bottom of a slot and raised quickly to the top. The point passing through the mass will pick up from five to eleven beads. When various colors are desired, separate stringers can be used.

Cost of Fertilizer Cut by Chemical in New Explosive

Manufacture of fertilizer and explosives is expected to be greatly aided by a chemical lately developed which hastens the

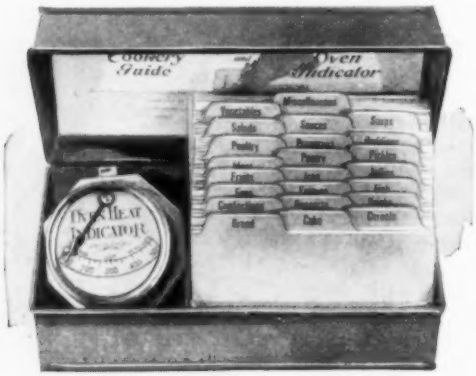


Government Chemist Who Developed Process of Uniting Nitrogen and Hydrogen Atoms

union of nitrogen and hydrogen atoms for the production of ammonia. One effect of the discovery is the development of a powerful war weapon through the explosives which are made possible. Production costs are lowered by the process which will be put in use in government nitrate plants.

Both Cooking Time and Oven Heat Are Given by Card Guides

Inclosed in an attractive steel cabinet, a card index of printed recipes, including baking and cooking instructions and oven



Metal Cooking-Guide Cabinet with Compartments for Card Recipe Index and Oven Thermometer

temperatures for preparing different articles, has been devised to assist the young housewife. With the index is included an oven thermometer which shows temperatures from 100 to 500 degrees and is designed to be attached inside the door. It enables the cook to follow the printed instructions on the cards and avoid mistakes. Recipes are classified in groups and alphabetical order.

Queer Jobs Undertaken by Women to Make Life Interesting

New ways of making life interesting while earning a living are constantly being found by women whose tasks now range from observation and charting of the skies and planets to cooking food and feeding it to swarms of plant germs, which are kept for the purpose of scientific study in laboratories of the government. Although women have practiced law, medicine and dentistry for some time, it has been only in recent years that they were installed in large office buildings as elevator operators, as attendants in automobile filling stations and placed in other departments of industry formerly occupied entirely by men. In research lines connected with the study of natural specimens of insect and small-animal life, women are to be found recording the habits and structure of subjects in many museums. Posters and drawings of value to cattle raisers and dairy farmers are the result of observations made by women trained for the purpose, while horticulturists are aided by women experts who specialize in learning the secrets of developing fruits and vegetables of better qualities. A great number of exhibits to be seen in natural-history expositions are the work of women artists, who prepare and set up the specimens composing such groups and design the artistic foliage and landscapes which make up the lifelike backgrounds.

"Loudest Noise" Deafens Persons Ten Miles from Blast

What is believed to be the loudest noise ever made by man is reported to have deafened persons within a ten-mile radius in France. Ten tons of explosive were set off in order to observe the speed of sound and to discover the cause of the "zones of silence," first noticed during heavy barrages in the war, when cannon could be heard at long distances, yet the explosions were inaudible nearer to the guns. Observers were stationed in many of the principal cities, some 600 miles away.

Woman Scientist of National Museum Whose Specialty Is Studying Deep-Sea Life, Examining an Octopus

Tinting Wax Imitations of Choice Fruit Specimens for Exhibition Purposes in the Department of Agriculture

Painting Pictures of Cattle, Part of Instruction Charts for Use in Teaching Farmers Care of Animals

Astronomer in the Naval Observatory, Who Helps to Map the Skies and Prepare Information Charts for Guidance of Ships

Making Large Drawings of Destructive Insects in Natural Colors for Use in Studying the Pests

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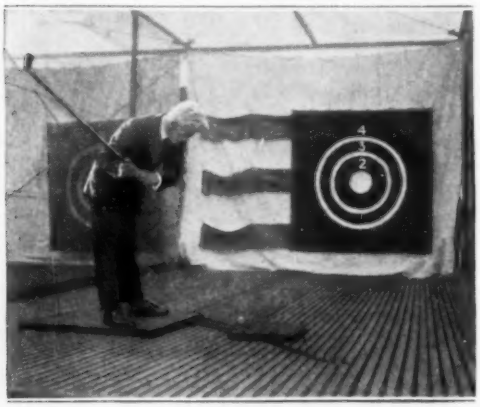
In a Laboratory Kitchen Mixing Special Food Called Media, on Which Are Fed Millions of Live Germs Kept in the Agricultural Bureau for Inspection by Scientists

Rifle Range Target in Golf Net Improves Player's Accuracy

To teach accuracy in driving, a steel golf-practice net has been installed in a Los Angeles club. It has the bull's-eye



Metal Golf-Practice Net with Bull's-Eye to Teach Accuracy in Driving

and circles of a rifle-range target at which the ball is driven. "Slicing" or "pulling" is accurately shown, and distance also may be gauged by the spot the sphere strikes. Being of metal, the net will withstand much abuse and the strongest drives.

Footlights for Amateur Stage Vanish under Floor When Idle

For use in stages of schools, auditoriums and lodge halls, disappearing footlights that fold under the floor when not in operation are being manufactured. Built in five-foot sections, the apparatus is designed for platforms where theatrical illumination is needed only occasionally. After serving their purpose, the lights can be quickly folded beneath the floor, leaving a level surface. The appliance supplies illumination for almost any setting without casting shadows on the backwall, it is said. Inclosed in a strong box arrangement, it is protected from injury between performances and can be easily set up.

How Folding Footlights Are Replaced in Disappearing Box beneath Floor of Stage

New Light on Holy Land History Revealed by Excavations

Excavations being carried out on the site of the City of David in the vicinity of Jerusalem, are said to have thrown new light on the early history of the country. The discoveries are believed to indicate that the origin of the city dates back much farther than had been supposed, that is beyond the time when the fathers of the Jewish race arrived in Palestine. Jerusalem was originally a stronghold of the Jebusites, and there are signs that it passed through many sieges before any that are recorded in the Bible or secular history.

Billion Dollars in Heat Wasted Every Year, Is Estimate

Heat losses of United States industries through radiation, conduction and convection, are equivalent to an amount of fuel costing $1,000,000,000 annually, a nation-wide survey has disclosed, according to a report made recently before a chemical society, which added that there are urgent problems to be solved in the field of heat economy. As one way to cut down the waste, the report suggested the use of insulated walls, which, it was declared, lose only 40 per cent as much heat as the uninsulated walls. Savings through this method, it was said, would aggregate 480,000 pounds of coal a year for 1,000 square feet of wall surface. At $5 a ton for coal, this represents a loss of $1,200, which would actually have been saved by the use of two and one-half inches of insulation.

Toy Balloons Help to Aim Big Guns by Showing Wind Direction

Toy balloons are being employed by the coast artillery corps to determine the condition of the air currents so that a higher average of accuracy in landing the shells of the big twelve-inch rifles may be obtained. The balloon is attached to a stout cord held in the hands of an observer on the ground. By this method it is said the strength, direction and speed of the currents can be ascertained and the aiming of the gun done accordingly.

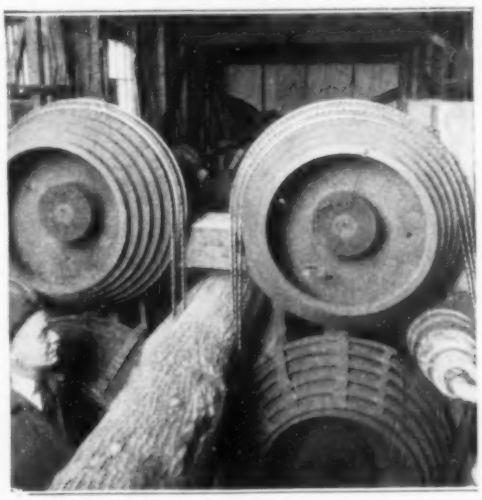
Coast Artillery Men Determining the Strength and Direction of Air Currents with a Toy Balloon to Obtain Greater Accuracy in Firing Their Twelve-Inch Rifle

Voice Pictures as Nerve-Cure Aid Are Tested in London

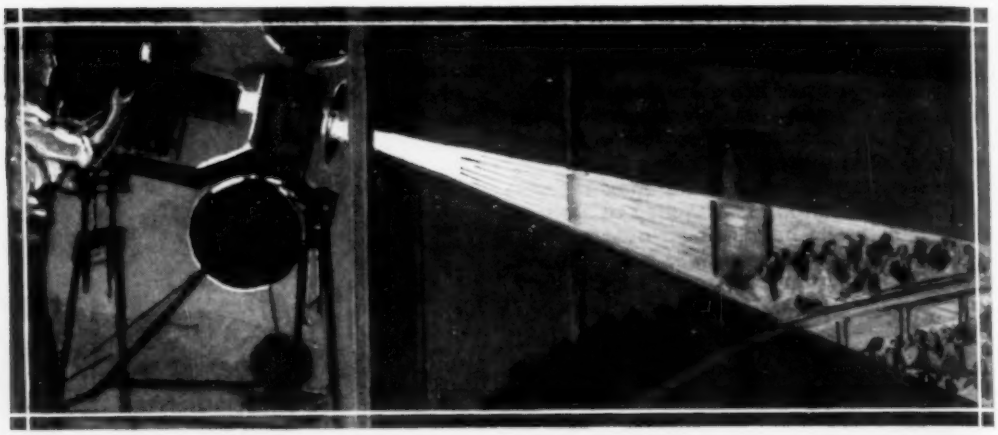
Various kinds of nervous disorders are said to be detected by the use of an instrument, invented by Prof. E. W. Scripture and tested in England, to take "pictures" of the human voice. Vibrations of tones spoken into a tube are registered in lines on a revolving drum covered with smoked paper. Persons afflicted with certain nerve diseases are said to pronounce various words in a way which produces abnormal lines on the recording mechanism, thus enabling the physician to diagnose their trouble.

Several Boards Cut from One Log by Groups of Band Saws

To save time, labor and power in lumber mills, a patented system of band saws run over stepped pulleys is used to cut several boards from a log in one operation by a Memphis, Tenn., man. The timber, traveling on a carrier, first passes between two sets of saws which trim the sides, and is reduced to boards by horizontal cutting ribbons beyond. The arrangement is said to be so simple that it can be set up in the woods, doing away with hauling of trees over long distances to mills. In a test, it is claimed that 187 logs, fourteen feet long and twenty-four inches in diameter, were cut up in eight hours. The machine can be driven by a gasoline engine, and enough saws put on it to strip twelve one-inch boards from a timber at one time.



Multiple Band-Saw Ribbons That Cut Several Boards from a Single Log at Once



Pulsated Light Gives Depth to Movies

Stereoscopic Effect of Leaping from Screen Is Produced without the Aid of Colored Spectacles

MOTION-PICTURE figures that appear to stand out from the screen, and which have all the features of living characters, have been made possible without equipping audiences with colored spectacles. Instead of using two separate films to produce these stereoscopic illusions, but one film is necessary, and it can be run off in an ordinary projecting machine.

Where formerly two separate sets of lenses in distinct registering devices were necessary to first get pictures which afterward had to be viewed through glasses, the new process results in registering all of the effect on one film. This "original" can then be used to make any number of copies that require no special arrangements of either screen or projector.

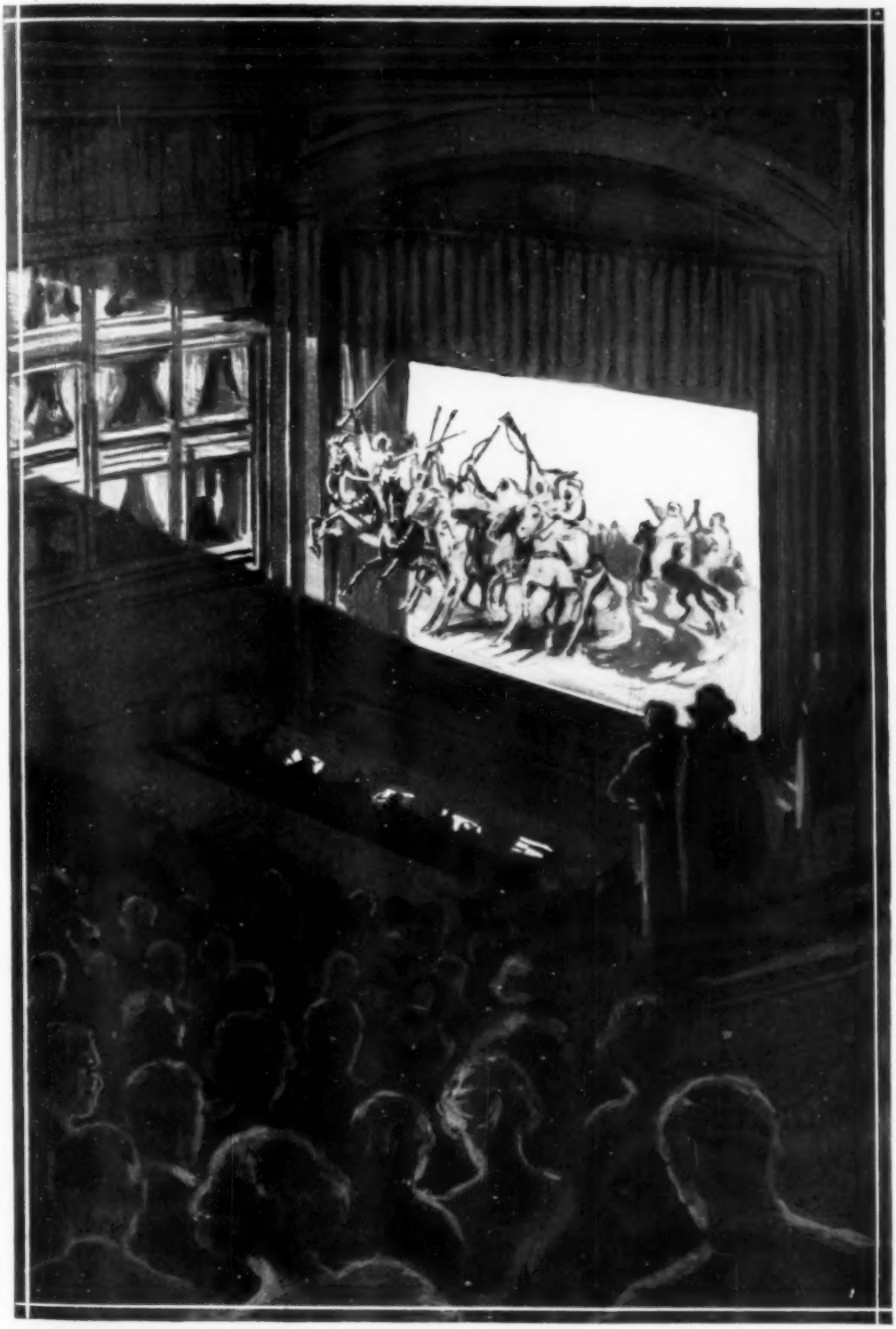
By means of what has been termed pulsated light, the two registering films are blended into one on a printing machine which produces the "third" dimension in combining the separate images. To convey the effects of the "pulsation" to the united image, a vibrating disk varies and harmonizes the illumination of the pictures thus eliminating any blur. When shown, these movies have not only width and length but also depth, the characters assuming the semblance of reality.

The special printing press is arranged to hold the two strips of film, one of which is the left-hand strip and the other the right-hand, under light waves directed on them while they are closely registered to make the final master film. This reel is of standard size and contains all stereoscopic elements required, in addition to the proper degree of pulsation. The ordinary stereoscopic pictures are not identical and if treated in the usual way would result in a blurred double image on the screen. By making the illumination of the two series of pictures unequal during the uniting of the views, the effect of depth is procured in the projected image.

Only by close study of the nerve structures and workings of the human eye was the inventor of stereoscopy by pulsation, Demetre Daponte, a Roumanian, enabled to develop the process, which, it is predicted, will make possible the production of plays in a manner similar to that now in use on the speaking stage.

Fourteen Million for Recreation Spent in U. S. and Canada

More than $14,000,000, over twice the sum spent for the same purpose ten years ago, was expended last year for public recreation in cities of the United States and Canada, according to reports of the Playground and Recreation association of America. Of the 680 cities that had community-recreation leadership, 660 maintained a total of 6,591 playgrounds under paid leaders. In 1906, when Theodore Roosevelt organized the association, there were only forty-four cities that had such centers. An average of 1,200,000 children and adults thronged the playgrounds each day last summer, the reports showed.



Courtesy The Sphere

How a Pulsated Motion Picture Appears on the Screen; Effects of Depth, Distance and Solidity Being Blended to Make the Figures Look as Though They Protruded into Space

Giant Blockhead Bows When Coin Is Placed in Its Back

Electrically operated, a giant blockhead that bows and drops a stick of gum from its mouth when a coin is placed in its back,

Electrically Operated Head That Bows and Dispenses Gum When Coin Is Placed in Back

has proved a favorite with Spanish children at an American amusement park in Barcelona. Many of the popular attractions found in similar parks in this country are reproduced in Spain, retaining the names by which they are known here, such as the "Temple of Mirth," "Razzle Dazzle" and "Crack the Whip." Electricity supplied by an American company operates the devices, lights the city, runs the street cars, and even draws fishermen's boats up the beach of the Mediterranean sea.

Chance Aids Inventors and Leads to Many Useful Discoveries

Many of the most useful inventions have been due to accident. For instance, William Wouldhave, who discovered the principle of the self-righting lifeboat, was toying absent-mindedly with a wooden bowl that had fallen into a well. Although pressed beneath the surface, turned over and placed in various positions, it invariably bobbed back, right side up, and thus led to the design of the boat. A bothersome trickle of oil in a coal pit led to the manufacture of paraffin wax candles. Alfred Nobel, founder of the prizes associated with his name, noticed that a cask of nitroglycerine in his father's chemical works had leaked into some sand used as packing. The trivial mishap suggested a safe and manageable explosive, and the result was dynamite. The propeller was inspired by a spinning sycamore seed, the rotary motion of which attracted the attention of a young engineer, and from the arrangement of the projecting wings, he devised the instrument that sends liners across the seas and airplanes through the skies. Holding a sensitive diaphragm and a needle in his hand while experimenting with a new type of telephone receiver, Edison started a light-hearted song. He noticed that the vibrations of his voice caused the needle to prick his finger slightly. Picking up a strip of telegraph paper, he smeared it with candle wax and moved it gently forward under the needle, shouting "Hallo, hallo," into the receiver. Then he ran the paper back over the steel point and heard his voice faintly repeated. Thus, the principle of the talking machine was discovered.

Safety Oil Candle Burns for Hours at Little Cost in Metal Holder

Outwardly resembling an ordinary candle, an all-metal safety light that burns kerosene has been placed on the market in England. One of its greatest recommendations is its economy, as it is claimed that it will burn for one hundred hours at a cost of about two cents. The upper part is a metal cowl fitted with a hinged glass window so that the flame is entirely inclosed. The candlelike central part is a tube carrying a wick of large capacity. The burner is fitted at the top end. To fill the lamp, a tablespoonful of oil is poured into the lower part. Danger of fire is lessened as the oil is quickly absorbed. The holder has a convenient loop for carrying.

AFRICAN ELEPHANTS MOST DANGEROUS BEASTS

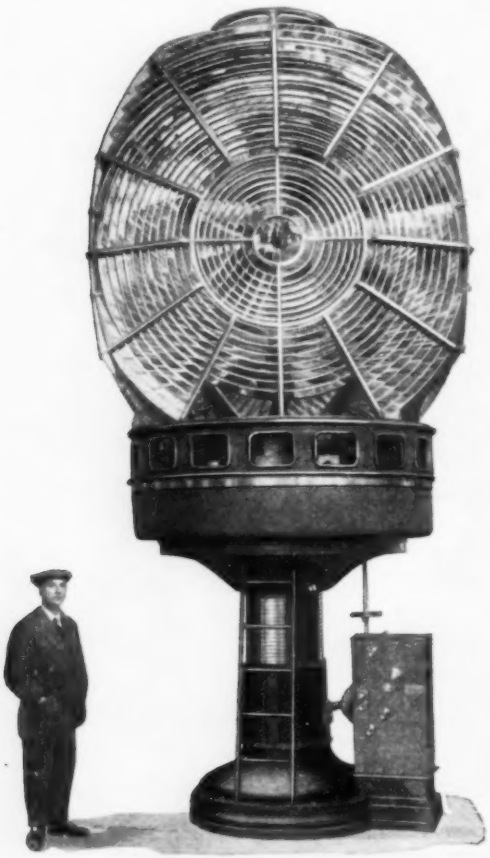
Elephants in Asia Are Taught to Perform Heavy Tasks and Are Seldom Hunted for Purposes Other than Training as Beasts of Burden; Untamable Animals Are Freed

As fierce as the tiger and more ferocious than the lion, the African elephant is known by many big-game hunters as the most dangerous of wild animals. Although its Indian cousin has been a servant of man for thousands of years and delights crowds at circuses throughout the countries where carnivals are popular, there is not a single recorded instance of the African elephant being tamed. A training camp was established in Congo several years ago in the hope of teaching them to work, but the attempt failed. The African elephant sometimes bulks thrice as big as most Asiatic specimens seen at a circus, according to

hunters. Their intelligence and cunning are amazing. They also possess a keen sense of smell, being able to detect the presence of a man at least 1,000 yards away. At the crash of a gun, they stampede, fading almost noiselessly, in spite of their huge bulk, into the jungle grasses. Hunters usually try to get within twenty yards or so before firing, but are often prevented from doing so by the savage charge of the cows. Recently, the elephant has been regarded as a carrier of sleeping sickness. For this reason and because they annually do tremendous damage to the native farms, they seem to be marked for extermination and already have been driven back into the more remote sections of the jungles.

Twenty-Four Mile Light Beacon near Site of Ancient Pharos

Not far from the site of what is believed to have been one of the oldest lighthouses,



Port Said Light Compared with Size of Man; Revolving Mechanism in Box at Right

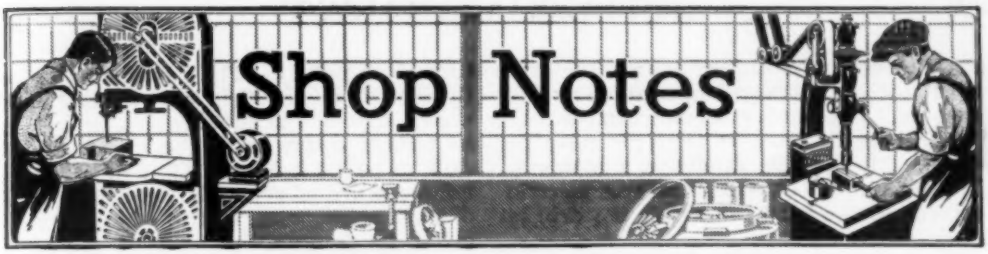
a tall structure which will house a beacon with a range of twenty-four miles is being ereeted to mark the Suez canal entrance at Port Said. The light will be nearly 200 feet above sea level and will rotate by means of clockwork, two times a minute, flashing once every ten seconds as it sweeps about the horizon. The revolving part of the apparatus weighs nearly four tons and is supported by about 450 pounds of mercury to eliminate friction. There are 579 pieces of glass in the prisms.

Lemon and Orange in Powder Form Rival Taste of Fresh Fruit

Lemons and oranges in a powder form may now be had for many purposes to which the fresh fruits are suited, and also for recipes where the natural product could not be used. The powders are said to contain not only the essentials of the juice but the solids as well, and as the entire fruits are employed in making them, they are declared to have a flavor and bouquet superior to those of the fresh article. In making ice cream, candy, cakes and cookies, they give a taste impossible with the fresh fruits, it is claimed, and are especially suited to making ices, cake fillings and pies. Soft drinks may also be prepared from them. They are easily kept fresh and retain their flavor a long time. Under the patented process of manufacture, considerable waste that now occurs in citrus-fruit regions will be avoided, it is believed.

Oil Well Produces Pure Asphalt

Said to be the only one of its kind in America, an Oklahoma oil well that is producing pure asphalt has attracted considerable attention. Asphalt-bearing sand was struck at a depth of 1,235 feet. The hole quickly filled up with the thick, sticky fluid which flowed over the top of the casing. Storage facilities were hastily arranged while pumping apparatus was erected. After the "head" of the well was off, however, and the initial pressure had subsided, it was found difficult to work the pumps. The substance was so thick that the machinery was nearly wrecked. By bailing out the asphalt and carrying it to a dump high up in a derrick, from which it is allowed to flow down into storage tanks, a production of about sixty barrels a day is obtained.



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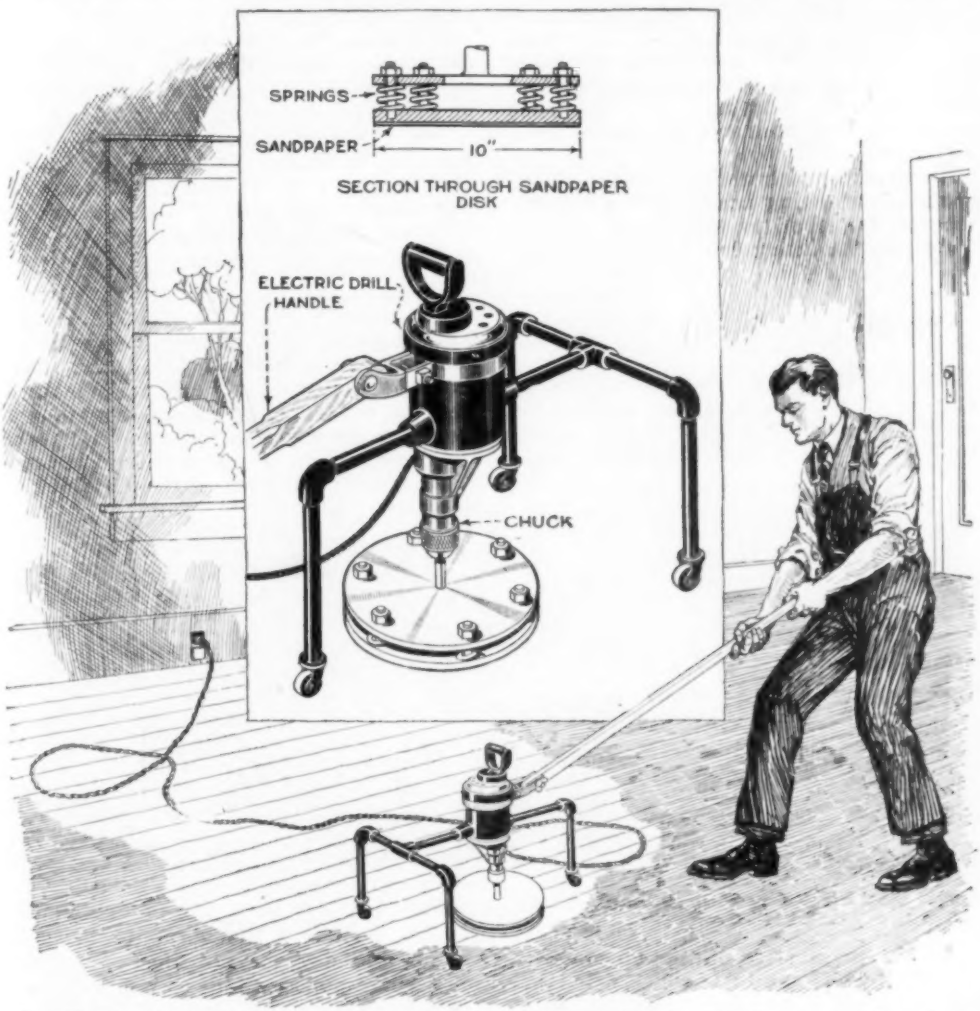
Homemade Portable Floor-Sanding Machine

By J. S. OPFERMAN

MANY painters and carpenters do not use a floor-sanding machine often enough to justify the expense of purchasing one, but as they need one occasionally, a homemade machine of the kind shown in the illustration will be found quite convenient. It can be improvised from an electric drill and some gas pipe, with little work



Portable Floor-Sanding Machine, Consisting of a Small Electric Drill and a Pipe Framework Mounted on Casters, Enables Carpenters and Painters to Sand Floors Quickly and Satisfactorily

and expense, provided, of course, the drill must not be purchased specially for this purpose. The outfit is so constructed that the drill can be detached from the gas-pipe framework and the handle in a moment. The sander can be used wherever electric current of the kind for which the drill is made, is available.

Most drills are fitted with two handles, which are screwed into tapped bosses on the sides. These handles are removed, and two 1-ft. lengths of pipe, of the same diameter and threaded to fit the bosses, are substituted. Other short lengths of pipe and fittings are then assembled to complete a three-legged framework, holding the drill as shown in the illustration. The legs should be about 8 in. high and are fitted with ordinary furniture casters to permit the outfit to be pushed over the floor. The pieces composing the frame should be of such a length that the edge of the sanding disk will project past a line drawn from the rear casters to the front one, so that the floor can be sanded close to the wall.

The sanding disk and shank are either in one piece, being turned down from a piece of flat steel, or the shank may be welded to the disk after both have been turned separately. The best diameter for the disk is about 10 in. and its thickness about ¼ in. The shank must, of course, be turned down to fit the chuck of the drill, in which it is held while in use. Six holes are drilled through the disk at equidistant points around the edge, as indicated, so that another disk of the same material, and turned to the same size, can be attached by means of studs threaded into holes corresponding to those in the first disk. The studs must be long enough to permit small coil springs to be held on them between the two disks and to allow nuts to be turned on the ends to hold the assembly together. The function of the coil springs is to give a certain degree of flexibility so that the whole surface of the lower disk will always lie flat on the floor and the pressure can be varied. Sandpaper is cut in 10-in. disks and glued to the bottom disk with elastic, non-hardening belt cement, which allows the paper to be pulled off easily when worn down. A handle of sufficient length, for pushing the machine, is clamped to the body of the drill as shown in the detail. When sanding close to the wall, the clamp can be loosened, the handle swung to one side, and clamped tight again.

Turning a Corner on a Conveyor

In the plant of the Purcell Butter company, at Elgin, Ill., a simple method of transferring packages from one conveyor to another running at right angles is em-

A Simple Method of Making Packages Turn a Corner on a Conveyor

ployed. At the junction of the two conveyors, a thick wooden disk or roller, fitted on a vertical shaft, is mounted. The packages are placed on the first conveyor in such a manner that, when they reach the junction, the inner end of each package will press against the roller guide. This retards the motion of this end, while permitting the outer end to swing around, and thus the packages are turned at right angles to the line of travel and guided onto the second conveyor.—Orin C. Crooker, Wheaton, Ill.

Keeping the Pop in Popcorn

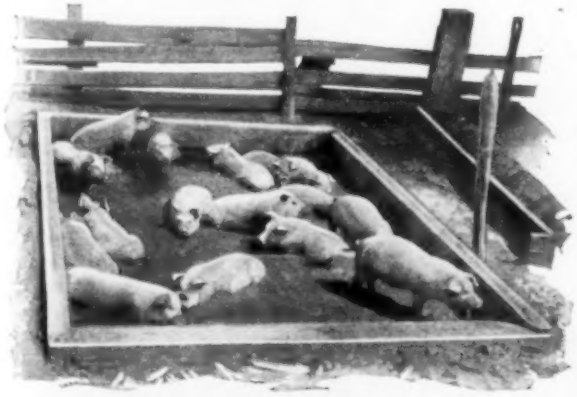
When popcorn is first harvested it is too wet to pop well, but under proper storage conditions it can be brought to good popping condition in a relatively short time. With artificial storage the drying-out process may be accelerated, but there is always danger of getting the corn too dry, which is just as bad as having it too wet. The safest way is to store the popcorn in a place where the outside air will have free access to it, but where the corn will be protected from the rain and snow. New popcorn stored in this way will be in excellent popping condition by Christmas. Popcorn kept in a living room will soon become too dry for popping. In most cases where popcorn fails to pop well, the trouble is caused by the corn being too dry rather than too wet. For popcorn to pop at its best, it should contain from 13

to 14 per cent moisture; but corn stored in a dry room will drop as low as 8 per cent during the winter months.

When corn fails to pop as well as it should, the following procedure will be found quite helpful: Two pounds of popcorn are put in a 2-qt. fruit jar and from two to five tablespoonfuls of water added, depending on how much the corn has dried out as shown by the way it pops. Very dry popcorn will not give over a third of the normal yield of popped corn and should receive the maximum amount of water. After adding the water, the lid should be screwed on the jar tightly, using a rubber ring. The corn should then be thoroughly shaken and allowed to stand for two days. This method has been found very satisfactory with popcorn that was excessively dry.

Concrete Hog Wallow

Hogs must have their mudholes. But the ordinary hog wallow in the barnyard soon becomes a filthy, reeking place, as a great quantity of straw, dirt and slops is continually dragged into it, which cannot be cleaned out. It is much better, therefore, to make a concrete wallow as shown in the photograph, which will permit the installation of a drain, down which the



Concrete Hog Wallow from Which Mud Can Be Easily Removed at Regular Intervals

mud can be washed at regular intervals. This will aid in making conditions more sanitary and help to combat disease.—J. C. Allen, West Lafayette, Ind.

Protecting Roads from Drifting Sand with Poles

Automobile roads built through country where the soil is light and sandy present many problems, both in construction and maintenance. Not the least of these is that of preventing sand from drifting onto the road, especially where grading has been done and a cut bank left along the side of the road. A simple method of overcoming this difficulty has been successfully used by road engineers in several places in Michigan.

Preventing Sand Drifts on Hard Roads by Means of Poles Laid on the Banks

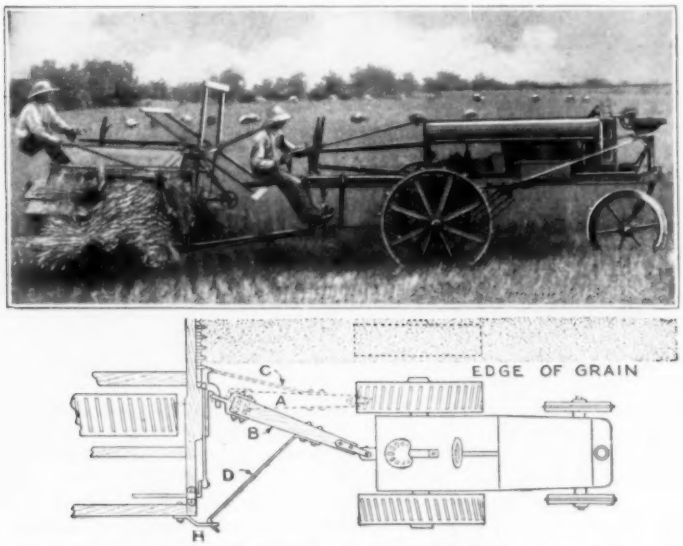
Long, slender poles, laid on the bank, fairly close together and at right angles to the road, as shown in the photograph, prevent the wind from eroding the surface of the soft bank and sweeping the sand along to form drifts in the road. The poles are usually dead and worthless timber, so that the cost is practically nothing. In the course of time, the banks become sodded with natural growths of wild grasses, so that the poles need never be renewed. This method has been found to be the cheapest and most satisfactory that has been tried.

Bushing for Accelerator Rod

Some foot accelerators used on Ford cars have a rod passing through the floorboard. The rod is liable to wear the hole larger, causing the rod to move out of its place and rattle. To remedy the trouble, a common tire-valve nut with a threaded sleeve can be turned down into the hole and fastened in place with a few small nails. The rod is then passed through the nut and connected. Such a nut has been in use on one machine for four years.

Adjusting the Binder Hitch for Small Tractor

Many small tractors will easily pull a grain binder, but as they are built with the idea of corn cultivation, they are found too wide to use with the binder when the regular tongue system of the latter is used. The wheel on the grain side crowds the crop down before the cutting bar can reach a full swath. Binder hitches are made, but for these small, wide-set wheel tractors they are of little use in correcting this trouble. The illustration shows how we overcome this difficulty.



Arranging a Binder Hitch So That It Can Be Used with a Small Tractor, Enables the Farmer to Harvest More Effectively

On our binder, as on most, the brace rod that holds the stub tongue in line with the binder is on the side of the tongue next to the cutting bar, bolted to the tongue, and hooked into an eye on the binder frame at the end of the bar. This is shown in the drawing by the dotted lines. The brace rod C was removed when the binder was in position for a full swath, and the tongue pushed over until it met the drawbar of the tractor when the latter was in position to travel along the side of the standing grain. A short piece of flat iron, H, was then fitted to the binder frame next to the bundle carrier, in such a manner that it would not interfere with the crank driving the sickle. To this bracket a brace rod, D, was fitted, the other end running to the tongue, and fastened with the same bolts as those used for the shorter brace originally used. A better bracing is provided for the tongue with this arrangement when turning corners, and there is no danger of kinking the brace, as it is in tension.

With one of these small but fast tractors a 40-acre field can be cut in a long working day, while with the same binder, used with horses, not more than 15 or 20 acres could be harvested.—G. G. McVicker, North Bend, Neb.

Novel Milk-Delivery Cart

The dairyman operating on a small scale will find a cart of the type shown in the photograph of great value in peddling his wares.

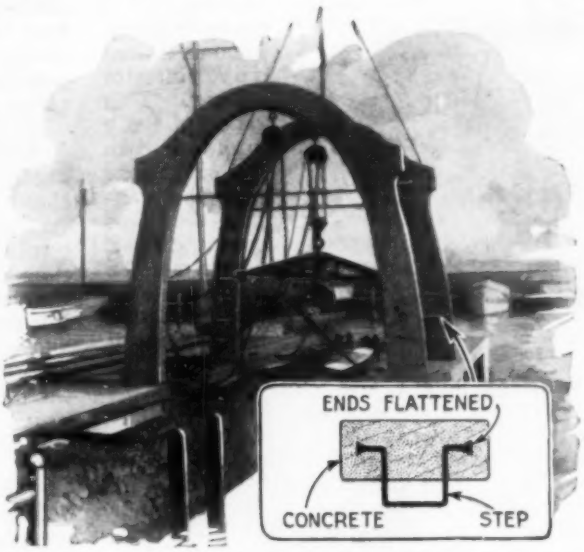
Special Delivery Wagon That Will Prove of Value to the Dairyman

The one shown is used by a man who sells his milk to the people of a small prairie town. A special box body is built on a light buggy frame and divided into compartments for the various sizes of bottles. It has room for forty quarts of milk besides several pint bottles of cream. On the back there is a small platform on which the dairyman stands when driving the horse.

¶Tin or copper can be soldered in a heavy wind, or where ordinary flux has a tendency to slide off, by using a flux consisting of resin dissolved in gasoline. The resin is first melted and enough gasoline is added to make a thick sirup. This is applied to the tin.

Novel Boat Hoist Made of Concrete

Many repairs on motorboats can be done without hauling the boat entirely ashore. Frequently it suffices to lift the bow or stern only out of the water as, for instance, in case of propeller repairs. Steel-girder hoists are sometimes used to lift the boat out of the water, but unless kept painted, the steel rusts rapidly. For this reason a concrete hoist is much more satisfactory. A hoist of this kind is shown in the photograph. It consists of two horseshoe-shaped members and a block and tackle is fastened under the center of each arch, a strong steel hook being set in the concrete, while it is poured, to hold the block and tackle. The lower part of each block carries a steel spreader from which the boat is suspended by chain slings when lifted. To afford easy access to the top part of the arches, steps, which are formed from lengths of ¾-in. iron rod, are set in the concrete as shown in the insert, and the whole rests on concrete platforms, a few feet above water level, so that every part of the boat is within reach. A hoist of this kind has been in use for nearly ten years.—C. A. Oldroyd, Barrow-in-Furness, England.



Useful Concrete Hoist, of Novel Design and Permanent Construction, for Lifting Small Boats Out of the Water

Carrying Case for Dynamite Fuses

Dynamite fuses are not regularly equipped with detonating caps, but when block shots must be fired, it is necessary to have a large number of fuses already fitted with caps. As these are carried to the blasting place, there is more or less danger of having them go off accidentally and injuring the workman who carries them. To eliminate this risk a quarry foreman provided a safety-first carrying bag, which is similar to an ordinary golf bag, but longer. A large number of fuses equipped with detonating caps can be carried in it without any danger of getting tangled or striking against the rocks.

Carrying Case for Dynamite Fuses Prevents Accidental Explosion of Detonating Caps

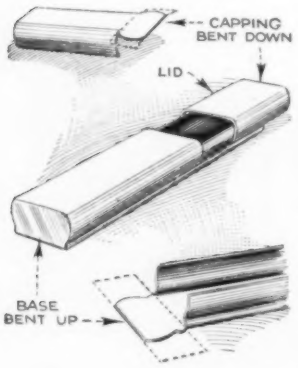
Another safety measure that works well in practice, where the fuses are cut progressively shorter so that the first fuse lighted will fire its shot at the same time as the last one, is to provide an additional fuse, which is cut shorter so that it will explode just one minute sooner than the first fuse. This additional fuse is lighted at the same time as the first one and is thrown down on the quarry floor. When this detonates it is a warning that the real shots will explode within the next minute. —Thomas J. Paxton, Chicago, Ill.

Plunger Aids in Laying Tile

In a large building in Washington, D. C., foot traffic is so great that it is necessary frequently to replace tiles broken by constant wear and tear. After the old tile has been completely removed and the hole prepared with cement, the new tile is picked up by means of an ordinary force cup or plunger of the kind used for cleaning stopped drains. It is surprising how easily the tile can be placed in its proper position in this way.—Reuben Stafford, Jr., Washington, D. C.

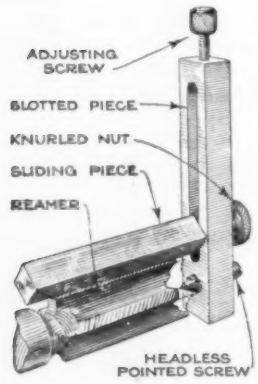
Cases for Small Tools

Handy cases for holding hacksaw blades, drills, files and other small tools that may be lost or damaged when lying around loose, can be made from metal molding, such as is used for interior wiring. This molding comes in two parts, the base and the capping that slips over the base. To make a tool case from this material, take a piece of the base of sufficient length and close one end as shown in the lower detail. The capping is cut in two pieces and the shorter one is closed at one end in the same manner as the base. The longer part of the capping is sweated to the base, while the other piece forms a sliding lid.—Thos. W. Benson, Philadelphia, Pa.



Measuring an Odd-Fluted Reamer

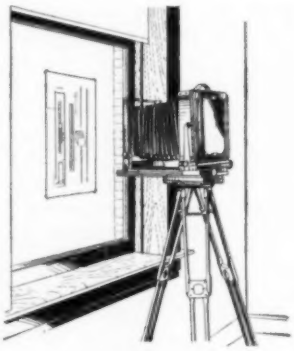
The large number of odd-fluted taps and reamers now on the market calls for some means of easy measurement as, obviously, these cannot be measured in the same way as the tools having an even number of flutes. The measurement of the odd-fluted tools is generally done by some more or less roundabout method, as by first reaming or tapping a hole and then measuring this to get the size. A useful tool can easily be made that will avoid uncertainty and delay, and, besides, will prove of great convenience in measuring the diameter of odd-toothed gears, although the latter require to be plugged for a center. The main part of the tool is made from ⅜ by ½-in. stock slotted and tapped for an adjusting screw at the top and for a headless pointed screw near the bottom. Next, a piece of ¼-in. drill rod is turned down on one end to fit the slot, and threaded for a knurled nut. This sliding piece is then filed or machined to the diamond-shaped cross section shown and the turned portion that enters the slot should be large enough to allow it to be flattened on opposite sides so that the sliding piece will remain in the position shown. The headless screw is ground to a conical point and this completes the gauge.



When measuring a tap or reamer, adjust the headless screw until it fits the center snugly when the tool is flat against the end. Then by means of the upper adjusting screw bring down the sliding piece until it just touches the nearest tooth and then tighten the knurled nut. Now swing the whole tool around on the center until it is exactly opposite a tooth on the reamer and measure over the whole in the ordinary manner with a micrometer. Subtract the thickness of the sliding piece (.25 in.), which leaves the diameter of the tool.

Photographing Tracings

About the simplest job done in a professional photography shop is the copying of black and white drawings, but the job is more difficult if the drawing happens to be on gray tracing cloth. The best way of making a good black-on-white copy in such a case is to stretch the tracing cloth against a window, and then photograph it. If the shutter of the camera is set at F. 16, only a one-second exposure is required and the result will be entirely satisfactory.—J. G. Pratt, Washington, D. C.



Taking Up Play in Bushings

When a bushing has worn until there is an excessive amount of play in it, and a new one is not at hand, it may be repaired in the following manner: Carefully caliper the shaft and the bushing to determine the amount of wear, then slit the bushing lengthwise, making the width of the slit three times the amount of the play, as previously determined. The bush-

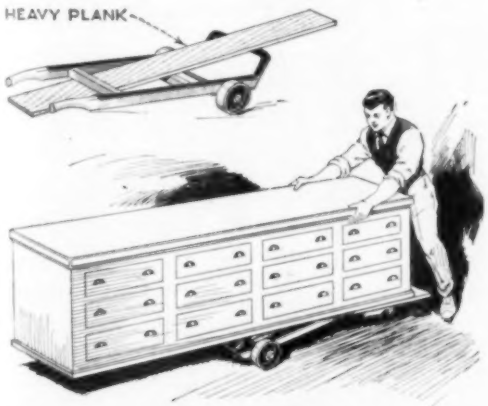
ing is then carefully hammered all around until the lips of the slit come together, and a piece of thin metal bent around the outside to serve as a liner or shim. The thickness of this liner will be equal to half the amount of play in the bushing. The latter is then pressed home, with the liner around it. It is not advisable to drive the bushing in with a hammer; it should be pressed in with an arbor press, or, lacking this, under the drill-press spindle, or even in a vise, if this can be done. If the inside of the bushing seat is well greased, no trouble will be experienced in pressing it and the liner in together.—Felix Helsmoortel, Saugerties, N. Y.

Using Two-Wheel Hand Truck for Bulky Loads

The small two-wheel hand truck can be used to advantage for handling bulky loads, such as desks, cases, machines and a variety of other equipment, by arranging a wide plank on it as shown.

The plank, which should be 4 or 5 ft. long, is placed under the crossbar at the handles and over the lift bar forward of the wheels. The load to be moved is tilted and the truck moved under the center, so that it is balanced over the wheels. It is then possible to move the load or turn it about easily.

This kink has proved of value in a large office building, making it possible to rearrange equipment without scarring hardwood floors as would be the case if the desks, etc., were pushed about on the bare floor. A further advantage of this method is that the hand truck can readily be pulled up steps, while with a four-wheel truck an elevator is necessary.



Utilizing the Two-Wheel Truck for Moving Cabinets and Other Heavy Equipment

Markers for Road Culverts

Many accidents are caused each year by automobiles running into ditches at the ends of small culverts on country roads.

Painted Markers Set at Ends of Road Culverts Protect Passing Motorists from Accidents

The culverts are usually from 16 to 20 ft. long and the ends are difficult to see, especially when the roadside is overgrown with grass and weeds. When two autos pass each other at these points, there is scarcely enough room and an accident is often the result. The danger can be eliminated by providing 7-ft. fenceposts as markers at the ends of the culverts. The drivers will not run into these very readily because they can easily be seen, especially if painted red and white.—Geo. G. McVicker, North Bend, Neb.

Spark-Plug Cleaner

Stranded copper wire makes a spark-plug cleaner that can be used without taking the plug apart and is harmless to the porcelain. It will not clean the insulator as well as when the plug is taken apart and polished with steel wool, but will serve in an emergency. The best results are obtained when a length of lamp-cord is doubled over and both ends used. The insulation of the wire should not be removed for more than ½ in. as it stiffens the end of the wire if left on.

A Novel and Effective Sled for Transporting Cordwood

Novel Cordwood Sled

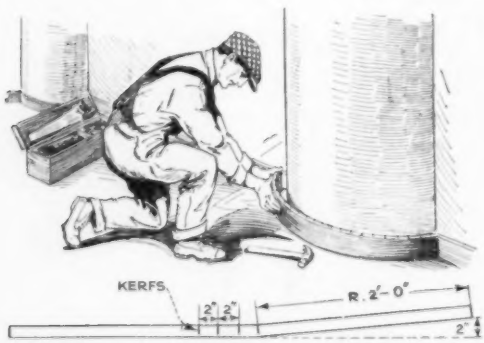
When cutting and trimming a scattering grove of second-growth timber, which was made into cordwood on the ground, a Wisconsin farmer was considerably inconvenienced by the necessity of carrying the pieces to be piled to a place where they would be out of the way during the curing period. Loading and unloading with a team and wagon consumed too much time, and the sled illustrated was finally constructed for the purpose.

A pair of discarded buggy shafts were cut and hinged at the points indicated, and a large screweye or a ring and staple attached to the end of each. To the bow ends two lengths of ½-in. rope were fastened, and provided with harness snaps; with a singletree chained to the crosspiece, as shown, the sled was complete.

In use, one horse is hitched to the sled, and, after the wood is piled upon it, the ends of the shafts are raised until the snaps can be hooked into the rings.

Laying Out Work for Kerfing

Many woodworkers are puzzled when they have a piece to kerf for bending, as to the proper distance to space the kerfs. This is a simple matter, however; to determine the distance from kerf to kerf, take the piece to be bent, mark off from one end a distance equal to the radius of the required arc, and at this point saw one kerf to the desired depth. Then hold the piece firmly down on the bench, or other straight surface, and lift the end until the edges of the kerf pinch together. Whatever height the end must be raised is the required distance to which the kerfs must be spaced.



A Simple and Accurate Method of Spacing Kerfs in Work to Be Bent

The illustration shows how simple this method is. For convenience we have taken a radius of 2 ft. The kerf is made with a 10-point saw to the ordinary depth, which is about three-fourths of the thickness of the material. On lifting the end we find that it must be raised 2 in. before the edges of the kerf come together; this, then, is the distance from kerf to kerf. When the piece is bent to the circle it will be found that each kerf pinches equally, and that the bend is uniform.

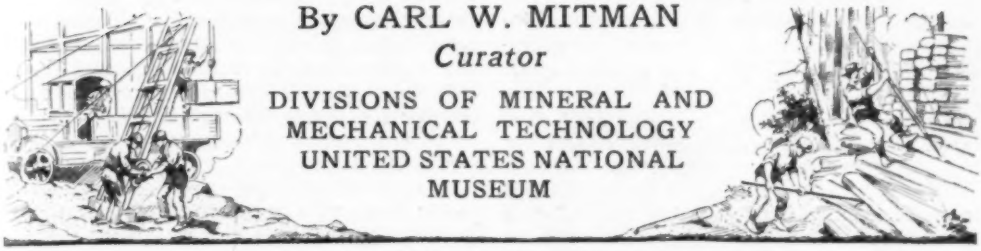
It should be remembered that the depth of the kerfs makes considerable difference in the distance between cuts. The deeper the cuts, the shorter the distance between them. The kind of saw used also makes a difference, as a fine saw brings the kerfs closer together, a coarse one making the distance longer.—H. H. Siegele, Emporia, Kansas.

Emergency Substitute for Broken Gland

When the gland on a 10-ton refrigerating machine broke it was found that there was no spare part among the plant supplies. An ordinary 2-in. pipe flange was obtained and a slot, large enough to fit over the piston rod, cut from the edge to the center. The flange bolt holes were then drilled out to fit over the studs and the improvised gland put in place. The time required for the slotting and reaming operations was only 20 minutes, and the flange gave just as good service as the regular gland.—J. J. Noble, Toronto, Ont.

MECHANICAL POWERS

By CARL W. MITMAN
Curator
DIVISIONS OF MINERAL AND MECHANICAL TECHNOLOGY
UNITED STATES NATIONAL MUSEUM



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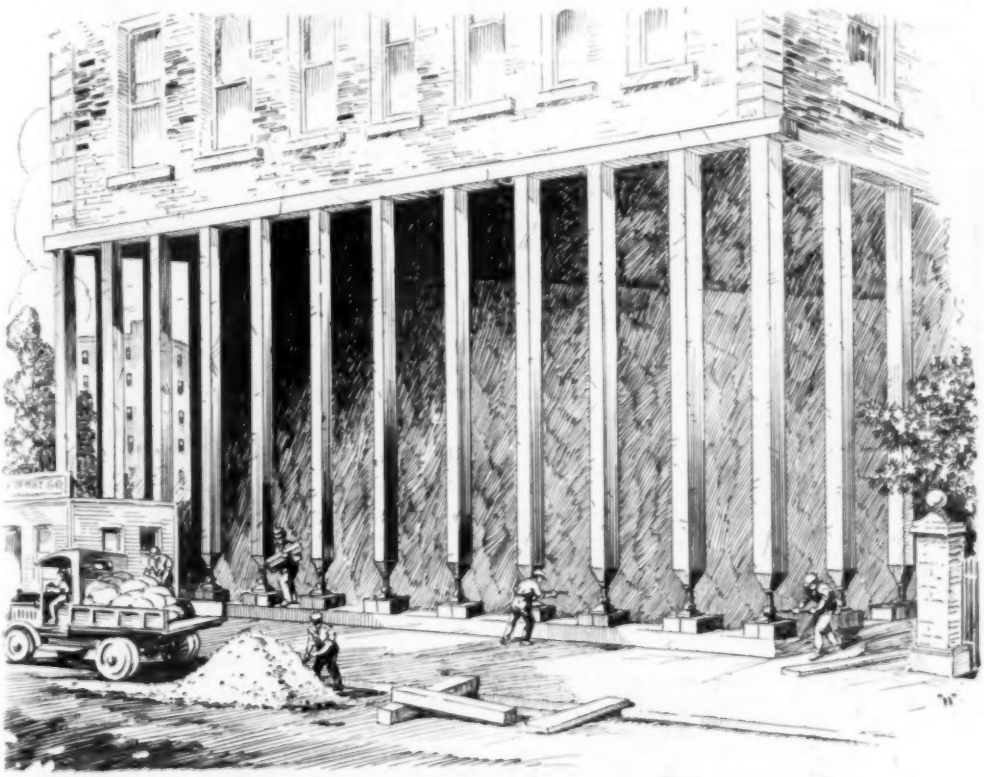
This is the seventh article of a series by Curator Mitman, explaining in simple language what every man who builds or designs a machine must know, and showing in detail just how to build a set of models of the mechanical powers that will exactly duplicate the set in the National Museum at Washington, D. C. The preceding articles appeared in the March, April, May, June, July and August issues.

Part VII—Forces; the Screw

ALL of the forces dealt with in mechanics are definite quantities, and to determine them with precision, three things must be considered for each one: First, the point of application; second, the direction, and third, the magnitude, or the energy with which the force acts. Lines are generally used to represent forces; one end of a line representing the point of application of the force; the direction of the line indicating the direction of the force, and the length of the line its magnitude. By this assumption, a force



This Illustration Shows How the Screw Is Used in Putting a New Front in a Building; Jack Screws Are Fitted in the Bottom of the Vertical Posts to Support the Upper Stories

is defined in each of its three elements and is thus brought within the limits of mathematical analysis. Whatever may be the number and direction of the forces acting upon one point, they can impart motion or pressure in only one direction. It is assumed, therefore, that there is a single force that can produce the same action as the whole group of forces, and which may replace them. This individual force is called the resultant, and the forces of which it is the equivalent are termed the components. Both the components and resultant may be interchanged without changing the condition of the body acted upon or the mechanical effect of the forces themselves. A force is, therefore, mechanically equivalent to the sum of its components and, conversely, any number of forces are mechanically equivalent to their resultant. Since forces are known only by their effect in producing motion or pressure, any forces that produce equal motions or pressures are equal.

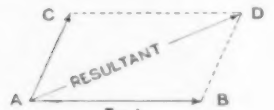


Fig. 1

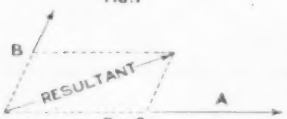
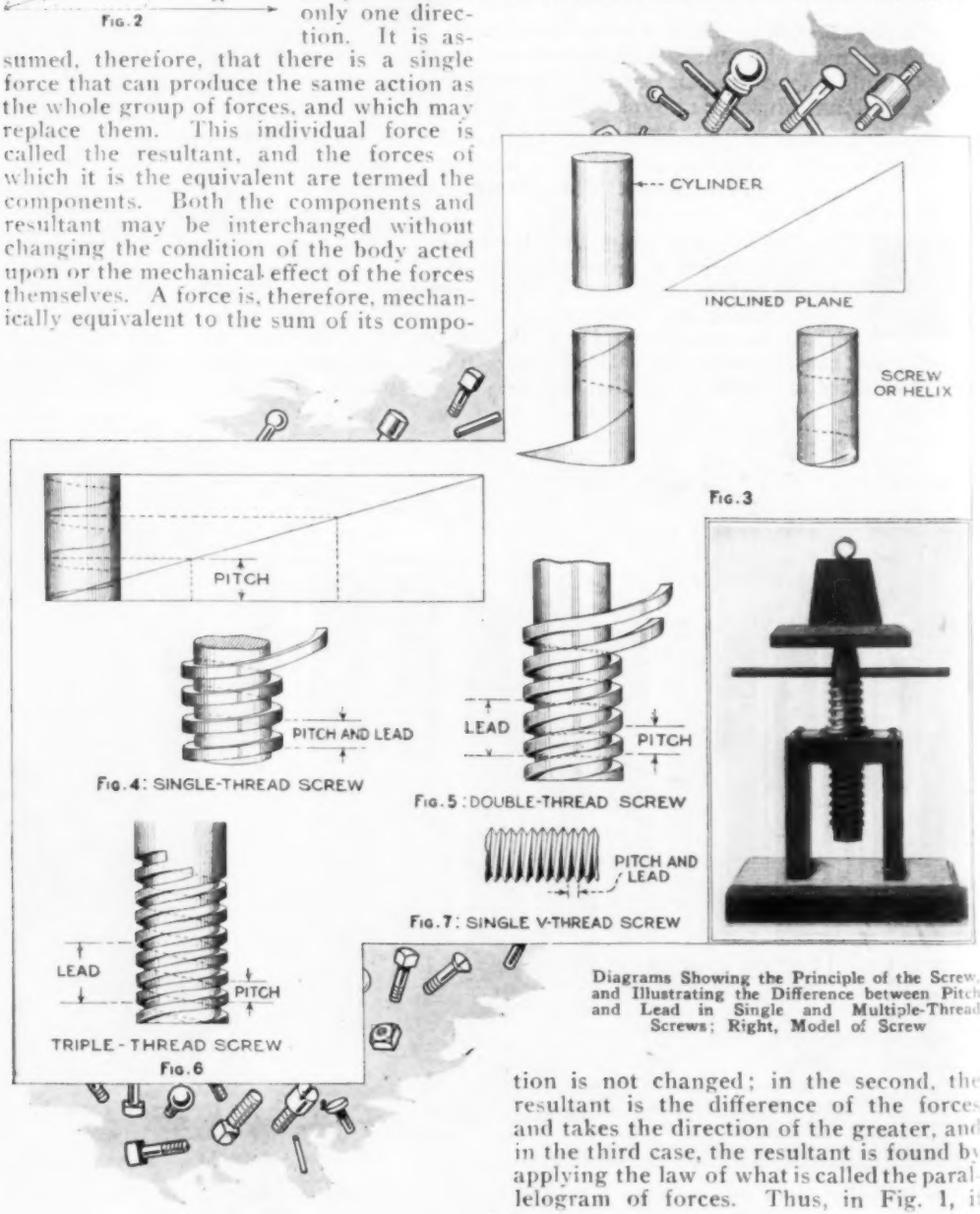


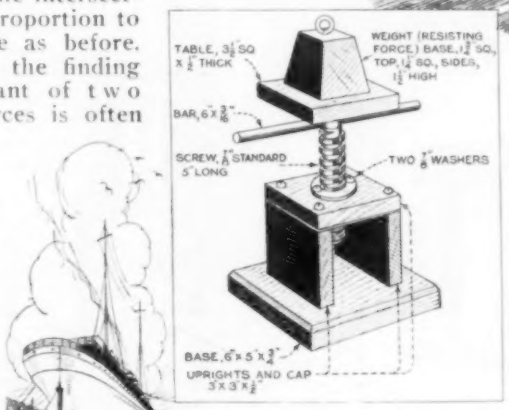
Fig. 2

When several forces act upon a body they may be arranged in three ways according to their direction: All in one direction; in exactly opposite directions, and at some angle. In the first case, the resultant is the sum of all the forces and the direction is not changed; in the second, the resultant is the difference of the forces and takes the direction of the greater, and in the third case, the resultant is found by applying the law of what is called the parallelogram of forces. Thus, in Fig. 1, it



Diagrams Showing the Principle of the Screw, and Illustrating the Difference between Pitch and Lead in Single and Multiple-Thread Screws; Right, Model of Screw

two forces applied at the point A are represented in direction and magnitude by the lines AB and AC (adjacent sides of the parallelogram ABCD) their resultant will be represented in magnitude and direction by the diagonal AD; or, in Fig. 2, if two forces A and B do not have the same point of application but it is evident that their directions intersect, the forces may be imagined as applied at the point of intersection and the resultant of the two forces may be found by constructing the parallelogram of forces, as shown, the lines being set off from the intersecting point in proportion to the magnitude as before. In mechanics the finding of the resultant of two or more forces is often desirable, and, in addition, the finding of the components of a single force is equally desirable. The solution of the former problem, as shown above, is called the composition of forces and that of the latter the resolution of forces, which is carried out in a similar manner to the composition except that the work is done in the reverse order.

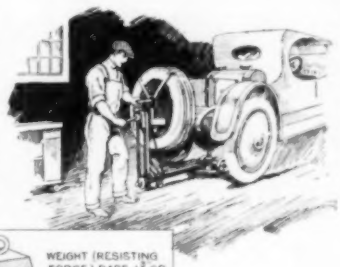

TABLE, 3½ SQ. x ⅛ THICK
WEIGHT (RESISTING FORCE) BASE, 1¾ SQ., TOP, 1¼ SQ., SIDES, 1½ HIGH
BAR, 6" x ⅜"
SCREW, ⅞" STANDARD 5" LONG
TWO ⅞" WASHERS
BASE, 6" x 5" x ½"
UPRIGHTS AND CAP 3" x 3" x ½"

Detail Drawing for Constructing the Model of the Simple Screw with Illustrations Showing How It Is Used

The screw bears the same relation to the inclined plane that a spiral staircase does to a straight one. Theoretically it is a cylinder surrounded by a spiral ridge or groove, every part of which forms an equal angle with the axis of the cylinder so that if the spiral could be unwound on a plane surface it would be an inclined plane. This is illustrated in Fig. 3.

There are a number of varieties of screw-thread forms, and also a variety of types. A single-thread screw is represented in Fig. 4, taking a screw with a square thread as an example. This may be considered, for our purpose, as consisting of a square bar wound in a helix or screw around a cylinder, and will illustrate, with Figs. 5 to 7, the difference between pitch and lead in a screw.

The pitch of a screw is the distance between the top of one thread and the top of the next, or, in the case of the square thread, from one edge of the thread to the corresponding edge of the next; and this holds true regardless of the type of screw, or whether it has a single or a multiple thread. The lead of the screw, however, is the distance that the screw will advance through the nut when turned through one complete revolution, and this varies with single and multiple threads.



In Fig. 4, the pitch and lead are the same, that is, the screw will advance in one revolution, a distance equal to the pitch. Fig. 5 represents a double-thread or, as it is sometimes called, a "two-start" screw; this has, so to speak, two square bars wrapped around the cylinder, each starting 180° apart. In this case, while the pitch is still the distance from one thread edge to the next, the lead is double this distance, for the screw will advance, in one revolution, a distance equal to twice the pitch. Similarly with Fig. 6, which shows a triple thread or "three-start" screw, where the ends of the threads are 120° apart, the lead is three times the pitch. This applies to all forms of screw threads.

Fitting the thread of the cylinder into a spiral groove cut in the interior of a block and attaching a lever to the head of the cylinder result in a combination of parts technically known as the screw and recognized as one of the mechanical powers. A conventionalized form of such a machine is shown in the first photo, reproduced from a model. The screw is used in a variety of ways to do work, the most common and yet opposite applications probably being the lifting jack (Fig. 8) and the screw press. The jack operated by hand levers can be designed to lift loads up to about 20 tons or exert a pressure in the form of a press of almost that same amount. There are screw presses

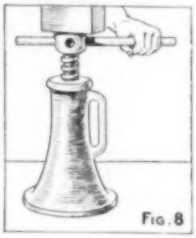
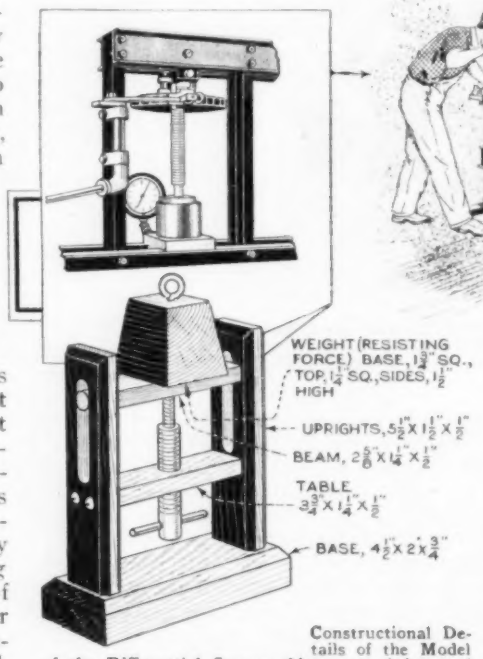


Fig. 8

for clothes, oil and fruit; there are screw-arbor presses in the machine shop and hay balers and waste-paper balers which use the screw to pack the bale. The wood screws and clamps used especially in the carpentry trade do their work through the agency of the screw. The screw propeller on watercraft is so named because its action is that of a screw which utilizes the water as a nut and so pushes the boat forward. In calculations involving the screw and lever, as in the jack in Fig. 8, equilibrium will take place when the applied force is to the resisting force as the lead is to the circumference described by the lever arm. During each revolution the applied force describes a large circle but the end of the screw advances only the distance between two threads; in other words, in this, as in all cases of the use of machines, what is gained in power is lost in speed. From this statement, it is evident that its mechanical efficiency is augmented either by increasing the length of the lever or by decreasing the lead. For instance, if the lead of a screw is ½ in. and the lever arm describes a circle of 5 ft. (equal to 120 half inches) circumference, an applied force of 1 lb. will balance a resisting force of 120 lb.; while with a lead of ¼ in., 1 lb. will balance 240 lb. In other words, the efficiency is doubled. It follows, too, that fine screw threads are more powerful than coarse ones. Continuing in this fashion, theoretically, the mechanical advantage of the screw can be made as large as we please simply by decreasing sufficiently the lead. In practice, however, this is impossible, for, if the lead is decreased too much, the threads themselves will not be sufficiently strong to bear the strain put upon them.



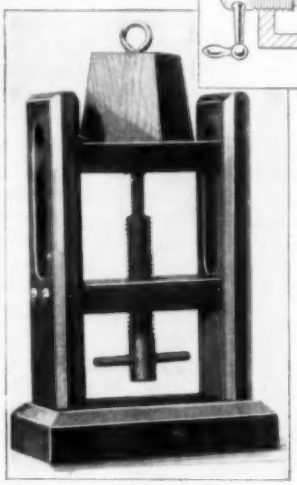
Constructional Details of the Model of the Differential Screw; Above, an Arbor and Gear Press Utilizing the Screw

To overcome this difficulty, John Hunter, the celebrated English surgeon (1728-1793), invented the differential screw. This consists of two screws, the threads of which are of different pitch and mounted upon the same shaft, one unwinding as the other winds. The effective lift or pressure obtained is equal to the difference of the leads of the two threads, and by making this difference very small great power may be obtained without the weakness due to a very finely threaded single screw. The second photo, reproduced from a model, incorporates Dr. Hunter's principle. The larger single-thread screw turns in a fixed beam. The inside of this screw is hollow and is tapped to admit the smaller screw, which also has a single thread. This screw is free to move up and down, carrying with it a sliding table, but is restrained from rotating by the table. It also has more threads to the inch than the larger screw. When the larger screw makes one clockwise revolution, it moves upward a distance equal to the pitch, but at the same time the smaller screw goes into the large screw a distance equal to its pitch; hence the smaller screw with its sliding table and also the load move upward a distance equal to the difference between these two distances. As in the cases of the Chinese or differential windlass and the differential pulley, the speed of operation of the differential screw is slow, but the mechanical advantage is enormous.

Figure 9 shows a slightly different application of this principle, and represents diagrammatically a part of a machine on which a very fine adjustment is required. Screw C, with a coarse pitch, works in the fixed bracket A, while D, which is a part of C, and has a fine pitch, works in the loose, sliding part B. When C is turned

the sliding part B moves a distance equal to the difference between the pitches of the screws.

Another common application of the differential screw, in a different form, is in taking up wear on the feed screws of planer toolboxes. Here the feed screw passes through a circular nut, which is finely threaded on the outside, the inside being threaded for the screw. This nut screws into a recess drilled in the toolbox casting, which is also threaded for the screw. Now, by screwing down on the nut, any backlash that has developed between the screw and the thread in the toolbox may be taken up very easily. The take-up nut is usually fitted with a locknut. A differential arrangement is sometimes used on a lathe tool slide, in which case the fine thread is used for feeding and the coarse for rapid withdrawal of the tool.



Model of the Differential Screw: Above, One Application of This Mechanism

For making the simple-screw model the following material is required:

Base, 6 by 5 by ¾ in.
Two uprights and one cap, 3 by 3 by ½ in.
Table, 3½ in. square by ½ in.
Screw, ⅞ in. standard, 5 in. long, with nut.
Two ⅞-in. washers.
Bar, 6 in. long by 3-16-in. diameter.
Weight (resisting force), base 1¼ in. square, top 1¼ in. square, side 1½ in. high.

Square and face all wooden parts with a finish bevel on top of the base and table. Turn off the threads of the screw for 1 in. of its length at one end, rounding the extremity. Three-fourths inch from the end, drill a 7/32-in. hole through the diameter and insert the rod therein. Locate the center of the cap and about this point chisel out the outline of the screw nut. Insert the nut in the space and retain it in position by bolting the washers on each face; thus, the walls of the cap prevent rotation of the nut and the faces of the washers prevent end movement. Form a bridge by screwing the cap to the top of the two uprights. Center this assembly on the base, securing it with screws and glue. Drill a No. 18 hole ½ in. lengthwise of the screw, in the rounded end. Drill a No. 29 hole in the center of the table and insert therein a 8-32 machine screw, 1 in. long, securing it with a nut. Place the extension of this machine screw in the end of the large screw and insert this assembly into the nut, revolving same into suitable position by means of the rod. Rest the weight on the table. Finish as desired.

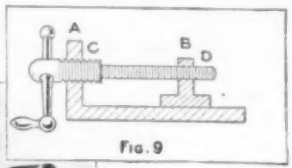


Fig. 9

For the model of the differential screw use the following material:

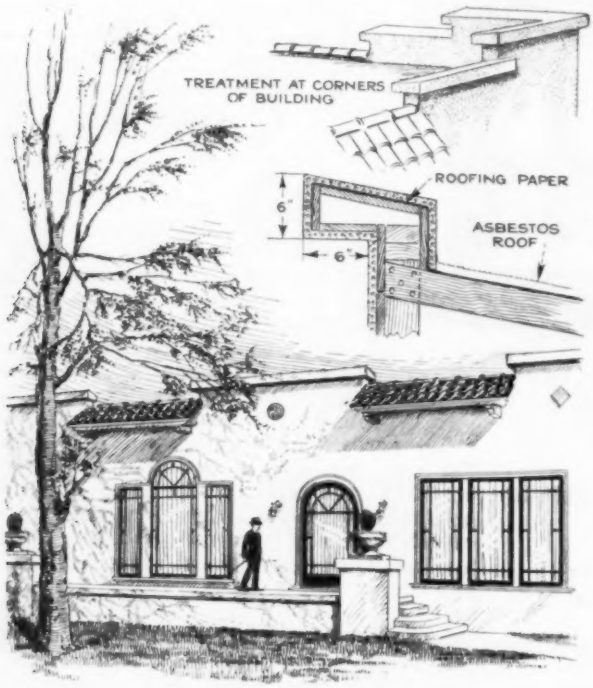
Base, 4½ by 2 by ¾ in.
Two uprights, 5½ by 1½ by ½ in.
Beam, 2⅝ by 1¼ by ½ in.
Table, 3¾ by 1¼ by ½ in.
½-in. bolt and nut, 3 in. long.
2-in. flat-head machine screw, 16-18.
Brass rod, 3-16 in. diameter, 2½ in. long.
Wood screws: four round-head, No. 6, 1 in.; four flat-head, No. 6, 1½ in.
Weight (resisting force), base 1¾ in. square, top 1¼ in. square, side 1½ in. high.

Square and face the wooden parts with a finish bevel on the top of the base and on the edges and one end of the uprights. Drill two ½-in. holes in the side of the uprights, with centers ¾ in. and 2½ in., respectively, from opposite ends. Saw out the material between these holes, leaving long round-end slots, 2¾ in. long. On a line across the uprights, 2 in. from the flat end, center two ⅛-in. holes ⅝ in. apart. In the center of the beam, chisel a hole to accommodate the ½-in. nut. Saw out shoulders in each corner of the table blank, leaving ½-in. central tenons. Drill and countersink a No. 6 hole in the center of this table and screw therein the 16-18 machine screw, sinking the head. Turn or saw off the head of the ½-in. bolt and drill a hole laterally through the shank to accommodate the 3/16-in. brass rod. In the other end of this bolt drill longitudinally a No. 6 hole, 1 in. deep and tap 16-18. Screw the ½-in. bolt the full length of its threads into the nut in the beam. Screw the table screw into the hole in the opposite end of the bolt. Secure this differential assembly to the two uprights by round-head wood screws passing through the two ⅛-in. holes in the uprights and into the beam, allowing the tenons to be guided by the upright slots. Center this assembly upon the base, securing with glue and screws from beneath. Place the weight on the table. Finish as desired.

¶A mechanic who lost the nut from a hand emery grinder when on a job away from the shop, made a new one by bending a piece of tin into a square, about ¾ in. across, laying this on the spindle and casting it full of babbitt.

Coping Serves Double Purpose

Stucco houses of Spanish type are becoming quite popular in many places. They are made without eaves, to imitate the adobe houses of early days. The top of the walls is usually made flat and a considerable amount of soot and dirt gathers on it, especially in cities. With every rain this dirt is washed off and runs down the walls, leaving ugly stains on them which greatly detract from the neat appearance of the building. This can be prevented by slanting the top of the coping toward the roof so that the water will run that way. A coping, 12 in. wide, slanting toward the inside with a 6-in. overhang and broken at regular intervals with tiled eaves as shown in the drawing, also gives a distinctive touch to the design of the building. The roof drains toward the center and then to one side, where the water is carried away by a single pipe.—A. May Holaday, San Jose, Calif.



Wide Coping Slanting toward the Inside Prevents Rain and Dirt from Running Down the Outside Wall

Using Blue-Stained Lumber

While blue stain in lumber is not an early stage of decay, but merely an indication of the presence in the sapwood of a fungus which does not materially affect the strength of the wood for ordinary commercial purposes, no absolutely effective method of preventing it other than kiln drying has been found. Kiln tests have shown that a temperature of 140° F. for a period of six hours is sufficient to kill the blue-stain fungus in the center of test pieces up to 4 by 4 in. square. No chemical dip for green lumber has been found that is remedial, in periods of continued rain, during the warm months. Until a suitable method of prevention is found applicable in cases where kiln drying is not feasible, intelligent utilization of the discolored stock remains the only means of discounting the damage done by the blue-stain fungus, when the methods now available have failed to keep it out. Resurfacing does not help when the fungus has made substantial penetration.

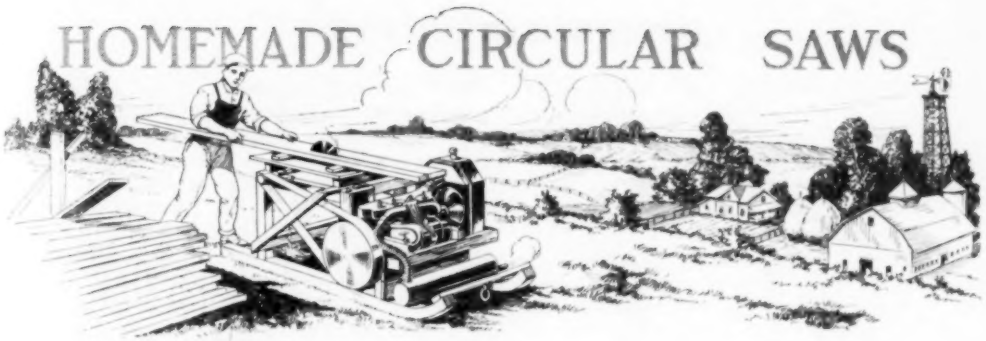
As blemish in any degree destroys the beauty of the grain of the wood, bright stain-free stock is highly desirable for a large variety of uses requiring a natural finish. But for many purposes where the wood is to be covered up or painted, and where the use of sapwood is permissible, there is no reason for discriminating against blue-stained material, provided no wood-destroying fungi are associated with the stain.

As the conditions that favor the development of the blue stains in sapwood also offer the opportunity for infection with the wood-destroying fungi, the holder of such material should assure himself that no indications of these harmful fungi are present before recommending the use of badly blued stock.

Blue stain is freely accepted in rough lumber, lath, scantling, plank, and some of the larger sizes of dimension stock. More could well be used in the manufacture of sash, doors, millwork, and other products when the wood is to be painted or the discoloration otherwise hidden from view.

Greater confidence in decay-free blued stock can be built up if the dealer will make clear to the customer the fact that blue stain does not seriously affect the strength of wood, and will suggest specific uses. Efforts in this direction will be greatly reinforced when blue-stained lumber comes into wider use and justifies the claims made for it.—U. S. Forest Products Laboratory, Madison, Wis.

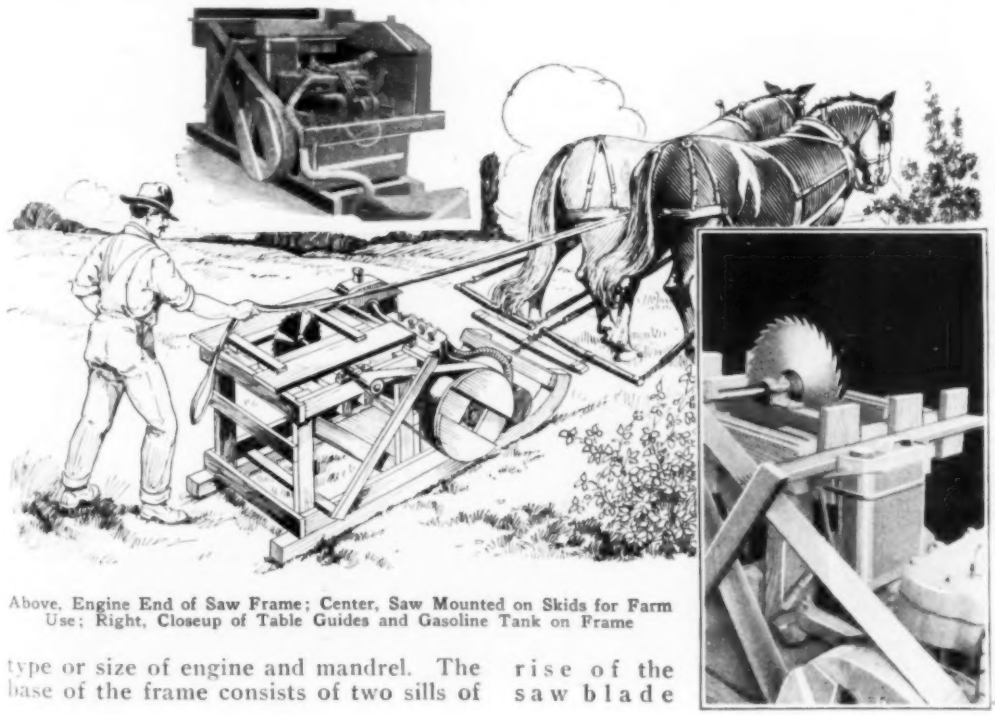
HOMEMADE CIRCULAR SAWS



ONE of the handiest tools around the farm is a circular saw; uses will be found for this tool almost daily. Even the amateur woodworker can well spare the time to make a circular saw when the time and labor saved on subsequent work are taken into consideration. The saws described in this article can all be made by any man handy with tools, and will prove desirable additions to any workshop.

The power saw shown in Figs. 1 to 8 was built by a California carpenter. The power plant is one taken from an old automobile; the belt, lacing, 1-in. mandrel and 12-in. cut-off and rip saws were purchased from a mail-order house at a cost of $12.50, and the cost of the bolts totaled $2.00. Fir, 2 by 4 in. and 2 by 3 in., was used for the frame. The drawings give the actual dimensions of the original saw, but these, of course, can be readily modified to suit any type or size of engine and mandrel. The base of the frame consists of two sills of the 2 by 4-in. stock, 4 ft. 11 in. long, assembled with three cross sills, 18½ in. long, the cross sills being gained into the long ones. The height of the saw frame is 26 in., and it will be noted from the drawings that the two mandrel rails, as well as the third rail at the outside, are gained into the end rails, and that the legs are bolted in two directions through the inside corners with ⅜-in. carriage bolts, 6 and 8 in. in length. To stiffen the mandrel rails, two 2 by 3-in. crosspieces are bolted edgewise on the underside with the same bolts that hold the bearings in place. The legs are braced by nailing 1 by 4-in. strips inside them, as indicated.

The detail of the saw table shows a form of construction productive of rigidity, while enabling the underside of the oak-flooring surface to lie close to the saw washers, thus providing for a maximum rise of the saw blade



Above, Engine End of Saw Frame; Center, Saw Mounted on Skids for Farm Use; Right, Closeup of Table Guides and Gasoline Tank on Frame

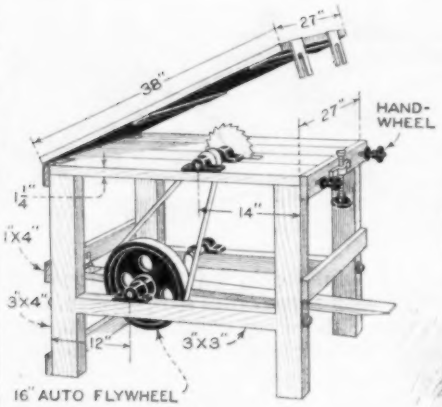
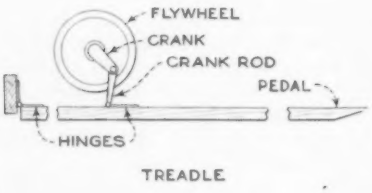


FIG. 9



TREADLE

FIG. 10

FIG. 11

Figs. 9 to 11, Working Drawings for Building a Foot-Power Circular Saw, with Detail of Mounting of the Treadle and a View of the Saw in Use; Fig. 12, Saw Mounted on the Front End of a Ford Automobile for Contractor's Use

FIG. 12

above the table. The oak flooring is run crosswise of the wide span between the rails, with the four end boards running full width, while the remaining space is filled with boards running lengthwise. The boards are toenailed with six-penny box nails and nailed through the surface with six-penny finishing nails, the heads being set in and the surface scraped flat and sanded smooth. A saw slit is cut as indicated, and widened for 6 in. along the center for dado-head clearance. To provide for accurate placing of the table, three pieces of 1 by 4-

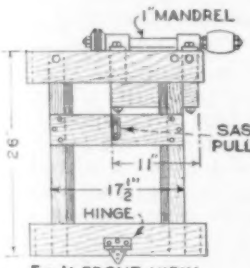


Fig. 1: FRONT VIEW

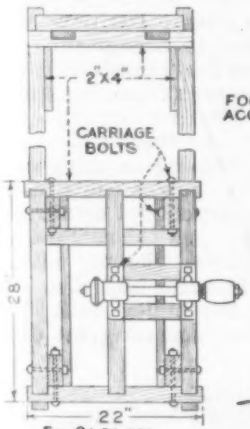


Fig. 2: PLAN

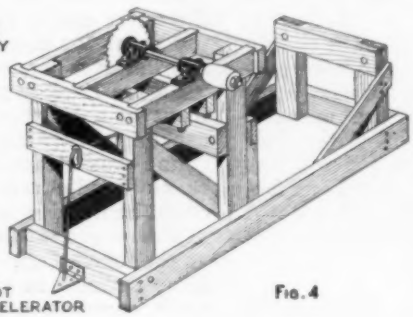


Fig. 4

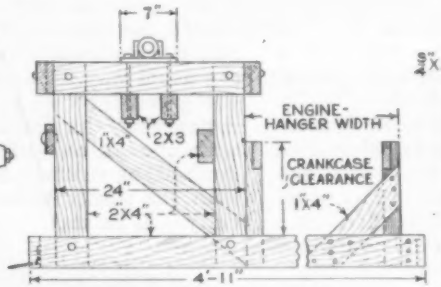


Fig. 5: SIDE VIEW

against the 1 by 6-in. pieces of the dado table when the rider is put in position for use. Since these pieces act as stops against which pieces for cross dadoing are held, they are cut accurately square.

In use, the table is slipped over the vertical guides of the saw frame and tacked in place with small nails to prevent shifting. The rider is then placed between the guides, which have previously been waxed to reduce friction, and the stock to be dadoed is held firmly against the near stop while the rider is slid forward against the dado saw. For long

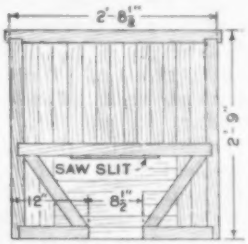
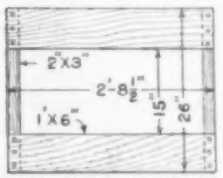
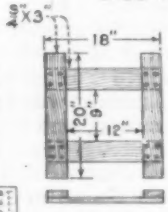


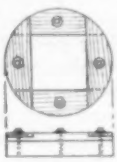
Fig. 3: SAW TABLE



DADO TABLE AND GUIDE
Fig. 6



RIDER
Fig. 7


FLYWHEEL
Fig. 8

Details of the Construction of the Power Saw; Figs. 1 to 5 Show the Construction of the Frame and Table; Figs. 6 and 7 the Dado Table and Its Rider, and Fig. 8 the Method of Building Up the Flywheel

in. stock, 7 in. long, are nailed vertically on the outside of the end rails of the mandrel frame, as shown in one of the photographs, and extend above the rails 3¼ in. These bear accurately against the table rails and prevent sliding of any kind. For use with a dado head, the special table shown in Fig. 6 is used. It consists of two pieces of 1 by 6-in. fir, 2 ft. 8½ in. long, nailed to crossrails of 2 by 3-in. stock, leaving the distance between the 1 by 6-in. pieces exactly 15 in. These pieces form guides for the rider, Fig. 7, in which two slides of 1 by 3-in. material are held parallel, 15 in. apart (outside edges), by crosspieces 20 in. long. The projecting 2½-in. lugs at each end of the crosspieces bear

work, it is useful to tack a strip of wood over the tops of the cross strips, so that a wedge or chisel can be driven between it and the work. Where it is desirable to dado at an angle, a suitable wedge-shaped piece is held between the stop and the work.

In mounting the engine, the automobile was stripped and the frame cut through behind the engine, and the assembly, complete with the radiator, mounted crosswise on the saw frame. The flywheel was thickened with two layers of wood, in the manner indicated, to form a drive pulley, which was belted to the mandrel. A gallon oilcan, with a feed pipe soldered to the lower end and held against the saw frame

with strips of thin iron, serves as a gasoline tank, and a stout cord brought under the table, through a sash pulley, and attached to a T-hinge on the base, as a foot accelerator.

It will be noted that no special provision is made for varying the height of the table. Since most dadoes in carpentry are only ⅜ in. deep, the dado rider is equipped with shims of suitable thickness under the cross strips to hold the stock at the right height, and as for tilting, the same effect is obtained by the use of guide strips tacked to the top of the table. The fence consists of a length of 2 by 3-in. stuff, nailed to the bar of a wooden clamp, which is screwed tight across the table wherever needed.

In measuring the belt, the length should be taken when stretched around both pulleys and 2 in. cut off before lacing. Friction tape wrapped around the mandrel pulley prevents slipping, but if the belt persists in coming off, two wooden strips can be nailed to the frame, above and below the belt, and connected with a third strip across the outer edges of the belt, and this will effectually prevent the loss of a belt that is properly fitted.

To make the saw still more useful to the farmer, a heavy sled or skid, made of 4 by 4-in. stock, can be fitted under the saw frame. The saw can then be drawn by a couple of horses or the tractor to the wood lot, or elsewhere it is required.

The saw shown in Figs. 9 to 11 is more suitable for the amateur woodworker than the one just described, and while it is operated by foot power, is every bit as practical for the small shop as the other one.

The legs of the frame in this case are made of 3 by 4-in. stock, and the crosspieces or shaft-bearing rails of 3 by 3-in. stuff. The rails may be gained into the legs as before, but a simpler construction is to fasten them, as shown in the drawing, with lag screws. The bearings for the crankshaft and mandrel, the mandrel, belt and hinges can all be obtained from mail-order houses. The crankshaft and flywheel can be picked up at any auto junk yard, and the crankshaft can be used in some cases just as it is, without sawing it off to length, and using only one crank. The table top should be made of oak, 1¼ in. thick—flooring boards will serve—and the hinged top of the same material. The auxiliary top is hinged to one end of the table proper, or rather to the top 1 by 4-in. cross brace at one end, and the other end of the table is fitted with two pieces of ⅜ by 2-in. iron or cold-rolled steel, drilled and countersunk for heavy screws and slotted for the ⅜-in. clamp screws. The clamp screws pass through the cross brace from the back, and are fitted with large handwheel nuts and washers. A table-raising screw is fitted to this end of the table also.

A foot lever is hinged to the center cross brace at the opposite end of the table, and connection made to the crank by means of a short connecting rod, as shown. The details of this rod are left to the maker, as the one on the original machine was made of scrap parts, and probably could not be duplicated; however, this is a part that is readily made. Care should be taken that the crankshaft is placed at such a distance from the pivot that the travel of the outer end of the foot lever will not be too great for convenience in operating it. The lever is made of 1 by 4-in. material.

Figure 12 shows a saw rigged up on the front of a Ford car by a contractor, for use on work away from the shop. The frame was attached to the axle and the crank handle removed, so that a sleeve could be fitted in its place. The inner end of the sleeve is slotted to engage the pins on the forward end of the crankshaft in the same manner as the crank handle, and a shaft carrying a pulley welded into the front of the sleeve. The front end of the shaft is carried in a bearing on the frame, and the pulley drives the saw mandrel in the usual way. Constructional details are not given for this saw, as the method of connecting the frame to the car differs with the automobile used, and also the method of driving the pulley shaft, but with the illustration given no great difficulty will be met.

Replacing Broken Wood Inlays

Broken wood inlays can be neatly repaired as follows: Dissolve in ether a piece of gum arabic large enough to replace the missing piece, making a solution about the consistency of soft putty. Add some finely powdered wood of the same kind, color and shade as the missing piece. This powder can be made by simply filing a piece of wood. When the mixture matches the wood, it is worked into the depression left by the missing piece, so that every corner is filled, and tamped down tightly, but allowing the patch to project a little above the surface. The tamping can be done by pressing in the mixture evenly with a spatula or, in case a large quantity is used, with a putty knife. After the mixture has dried thoroughly, it is sandpapered down and polished.—Matt C. Roemer, Appleton, Wis.

Emulsion for Spraying Fruit Trees

An emulsion of kerosene and water is effective for killing all leaf-eating or sap-sucking insects on fruit trees. One pound of wheat flour is mixed in 1 qt. of kerosene and then about 15 qt. of water are added. This mixture will remain emulsified for some time, but it is best to use it immediately.—L. W. Walker, Wellington, New Zealand.

A Stanchionless Dairy Barn

There is a dairy barn near Omaha, Neb., which houses 76 cows without having a single stanchion, as shown in the photo. The owner claims that this arrangement gives the cows more freedom and costs much less than stanchions. The interior of the barn has a row of 6 by 6-in. posts on each side of the feed alley to support the roof. Near the bottom of each post an iron rod, bent to the shape shown, is provided to hold a chain, which is run along the posts the whole length of the barn and is securely fastened at both ends. A rope with a harness snap is put around the neck of each cow and then snapped to the chain. As the bars on the posts are 14 in. long, the chain can be moved vertically this distance, while lateral movement is limited by the length of the rope, so that the cows cannot crowd each other. Another advantage of the freedom from stanchions is that the barn can be cleaned much more easily, a decided advantage in the average dairy.—Dale R. Van Horn, Walton, Neb.

Stanchionless Dairy Barn Houses a Large Number of Cows and Can Be Cleaned Easily

A Novelty in Cellar Excavation

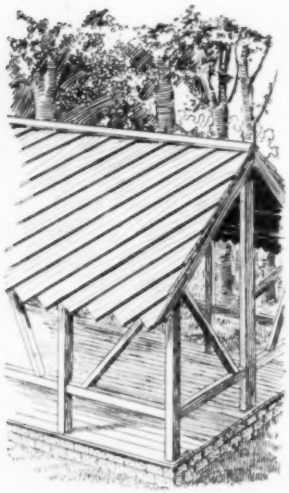
Basements for large buildings are usually dug with steam shovels, or some similar type of excavating machine. In such cases, an inclined roadway is left in some part of the basement over which the machine pulls or pushes itself out of the basement when the job is finished. The roadway is then removed by men and teams. The complete excavation of all material in a comparatively small cellar by a steam shovel, and the subsequent removal of the shovel by raising it on jack screws and moving it out on rollers, is a distinctly novel performance.

A Novelty in Small Cellar Excavation; the Shovel Was Jacked Up and Removed from the Hole on Rollers

The accompanying photo shows a 21-ton ¾-yd. shovel being removed in this manner, after having completed the excavating of a cellar, 12 ft. deep, in the congested district of Dayton, Ohio. The use of teams and wagons was impracticable on account of the small area of the excavation and the cramped quarters in which it was located. It required one day to dig the cellar, and one day to remove the shovel.—Ivan E. Houk, Dayton, Ohio.

¶ In making a mechanical drawing, the French curve was found too short. A length of ⅛-in. wire solder bent to the desired curvature was found to be an excellent substitute.

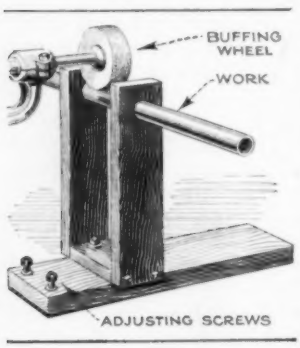
Novel Roof Economizes Lumber



Temporary buildings can be roofed much more quickly and with less lumber if the roofing boards are laid across the rafters diagonally, as shown in the illustration. Each board overlaps the one below it in order to shed rain, making the roof practically waterproof. Roofs made in this way have been found quite satisfactory.—Bunyan Kennedy, McCool, Miss.

Stand for Tube Polishing

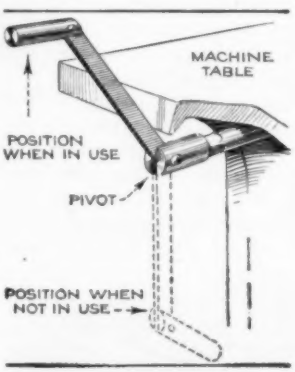
Anyone who has had the job of polishing brass tubes as commonly used for rail fittings will appreciate the method shown in the drawing, as it relieves the operator of most of the exertion required. By using this method large lots of tubes have been polished without undue fatigue, whereas it is a very tiring task when each tube must be held in the hands and pressed against the wheel by the operator. When using the method illustrated, the tubing is slipped through holes drilled in a wooden stand, made up of hardwood planks, the base being about 6 ft. long and fitted with two adjusting screws at one end.



Two shorter sidepieces are bolted to a center piece, and this is in turn bolted to the base near one side, just tightly enough to allow it to be swung on the bolt without difficulty. Both sidepieces are drilled through near the top to take the tubes to be polished and the stand is set up under the buffing wheel. The operator inserts the tube through both holes in the fixture and stands on the base while revolving the tube and pushing it along. To prevent a hollow being worn in the center of the wheel, the tube is worked back and forth sideways now and then. It is for this purpose that the bolt connecting the sidepieces to the plank on the floor is put off center, so that a slight side movement of the tube sweeps the latter across the face of the wheel. As the wheel wears down, the two screws in the end of the plank are turned to raise the stand, in order to attain the right pressure on the wheel.—Harry Moore, Montreal, Can.

A Comfortable Machine Handle

In many instances the handles supplied on machines are not suitable for the conditions under which the machine is used. Handles for raising tables, for example, are usually made in such a way that they barely clear the edge of the table, and the operator's fingers are liable to be pinched. If the handles are bent outward to give good clearance they interfere with the free movement of the workman unless they are taken off the machine after use, which is also inconvenient. To overcome this trouble the handle shown in the illustration was devised and found entirely satisfactory, as it has the advantages of providing abundant clearance and being completely out of the way when not in use. The sleeve fitting the rod on the table screw is slotted on the end opposite the square to take a flat extension, which carries a round handle riveted tightly at an angle at the other end. The extension piece turns easily on a pin driven through the sleeve and is rounded at this end to permit it to drop down as shown. The slot in the sleeve is cut at about a 45° angle to the axis so that, when the handle is pressed up against the bottom of the slot while turning, it clears the table easily. The raising or lowering of the table is always finished with the handle up, and, when released, it drops completely out of the way.



RADIO

Storage Battery for Dry-Cell Tubes

By L. B. ROBBINS

DRY-CELL tubes are very popular, especially those consuming only .25 amp. at 1½ volts, which require but a single dry cell. The only drawback to them is that when using three or four tubes, the replacing of as many dry cells every two or three weeks (if the set is used much) costs considerable money. At 40 cents each, for four tubes, it means $1.60 each time new ones are purchased, and the old ones are practically good for nothing.

A storage battery for lighting these tubes can be built for less than $2, and, with proper care, should last four or five years. If of about 100-amp.-hr. capacity, it will light four .25-amp. tubes for between 300 and 400 hours before requiring recharging, and that at a cost of not over $1. The battery shown in the illustration has proved entirely satisfactory in use. First, an old automobile battery—6-volt, 100-amp.-hr. capacity—was dug out of the scrap at a battery-service station. Many such batteries—useless for their original purpose—can be picked up for next to nothing. One should be careful, however, to select one in which the posts are intact and the cells tight.

The battery having been obtained, it was set on the bench and the sealing compound softened by pouring boiling water on it, so that it could be chipped and pulled away in large chunks. This was continued until the cells were clear. It

Set of Negative Plates as Taken from the Battery Shown at A; B Is the Separator and C the Finished Battery; This Cell Has the Original Filler Plug, but if This Is Spoiled, a Cork Can Be Used as Suggested

may be necessary, in some cases, to knock off the wood casing and saw through the lead connectors.

When the cells were clear, the sealing compound was cut away from the tops of the individual cells and the plates lifted out. The acid remaining in the cells was then cleaned out, and the sediment knocked from the bottom. Then the cells were thoroughly flushed out with warm water and set aside, upside down, to dry.

The plates were then examined, and the best set of negative plates—the light-colored ones—chosen and set to one side. The positive plates were found beyond use, as they usually will be. These were replaced with a new set purchased from a battery-service station to match the negative set, taking care to get just as many plates in the new assembly as in the old one. The positive plates should be one less in number than the negative ones.

The plates were assembled in exactly the same way as they were when removed from the cell, separators being inserted between them and the posts placed opposite each other. They were then placed in a cell that had proved sound and tight. A piece was cut from one of the spare cells to fit in the top of the cell used and holes made in it for the posts. A ½-in. filler hole was bored in the center and a cork inserted in it. Sealing compound was next poured in until the cell top was completely filled to a depth of ½ in. Finally, a box was made, with a lifting strap, and the cell inserted and sealed in the box. When filled with electrolyte the battery was ready for service. In using the storage battery, be sure to take a hydrometer reading every two or three days, and recharge whenever the gravity gets below 1.250. A gravity of between 1.280 and 1.300 will insure a fully charged cell and give complete satisfaction.

With a home charger, the expense of recharging can be cut down considerably. The writer uses a Ford generator belted to a small pumping engine, cutting down the voltage by means of a wire rheostat to about 3 volts. Two hours' charging twice a week keeps the battery fully charged all the time.

Radio Aids New York's Smallest Bookshop

The miniature bookstore shown in our photo is the smallest in New York, and is

New York's Smallest Bookstore Finds Radio a Great Help to Business

owned and operated by Miriam Rankine Blacker. It is equipped with a complete radio-receiving set.

Miss Blacker had the radio set installed when she discovered that the various stations were broadcasting stories, novels, household hints, etc., which created quite a demand for the books and the magazines from which the stories and hints were taken. She now keeps these in a special section of the shop, and is able to furnish them immediately.

Paint for Cardboard Panels and Coils

An insulating paint, which has been found serviceable for painting cardboard panels and coils in radio work, can be made by anyone at practically no cost. A pint of denatured alcohol is obtained, and an old phonograph record, which is broken up into many small pieces, is dropped into the alcohol. This can be done best in a fruit jar. The cap is screwed down tightly and the mixture allowed to stand for a few days until the pieces of record have been thoroughly dissolved. The mixture is stirred well before it is used and is applied with a brush. The work must be done fast, as the paint dries rapidly, leaving a black film on the surface. Two coats are sufficient for any material. The application stiffens the cardboard considerably and produces a fine dull finish. One pint of the mixture will cover from 15 to 20 sq. ft., and sometimes more.—David J. Morris, Weir, Tex.

¶In the table on page 129 of the July, 1924, issue, for UC-301A and UC-302 tubes read C-301A and C-302.

Radio Increases Vocabulary

Approximately five thousand new words have been contributed to the English language by the advent and wide dissemination of radio, according to Dr. Frank H. Vizetelli, editor of the New Standard dictionary since 1891. Ten years ago comparatively few people gave much thought to radio, never concerning themselves about radio-frequency problems or dreaming of such words as heterodynes, superdynes and autodynes, and others. But now many of these words are in common usage even among children, who surprise older people by their mental alacrity and aggressiveness in this new field.

Talking through Your Own Loud Speaker

Many radio fans are having fun talking through their own loud speakers. The trick is simple; connect the headset across the primary of the transformer of the first stage of amplification, the B-battery being connected and the tubes lighted as usual. Now, by talking into the headset as shown in the photo, the loud speaker will repeat whatever is said. This is one way of "getting distance"; put the loud speaker in another room and have the folks listen in while you talk into the headset. It is then possible to make the loud speaker say "This is 2-LO, London, England," or announce the name of any distant station, when in reality the set may not be capable of receiving over a range of more than a few miles.

This Shows How the Headset May Be Used to Make the Loud Speaker Talk

The First Radio Wedding

In the first wedding ever broadcast by radio, Wendell Hall, the "red-haired music maker" known throughout the country for his radio concerts, was married to Miss Marion M. Martin, a Chicago newspaper woman. The ceremony took place at station WEAF, and was broadcast by WEAF, New York City, WCAP, Washington, D. C., WJAR, Providence, R. I., and WGN, Chicago. The officiating minister was Dr. F. S. Idleman, of the First Christian Church of New York City, and the attendants were Thomas Campbell, famous track star, and Dorothy Fullerton.

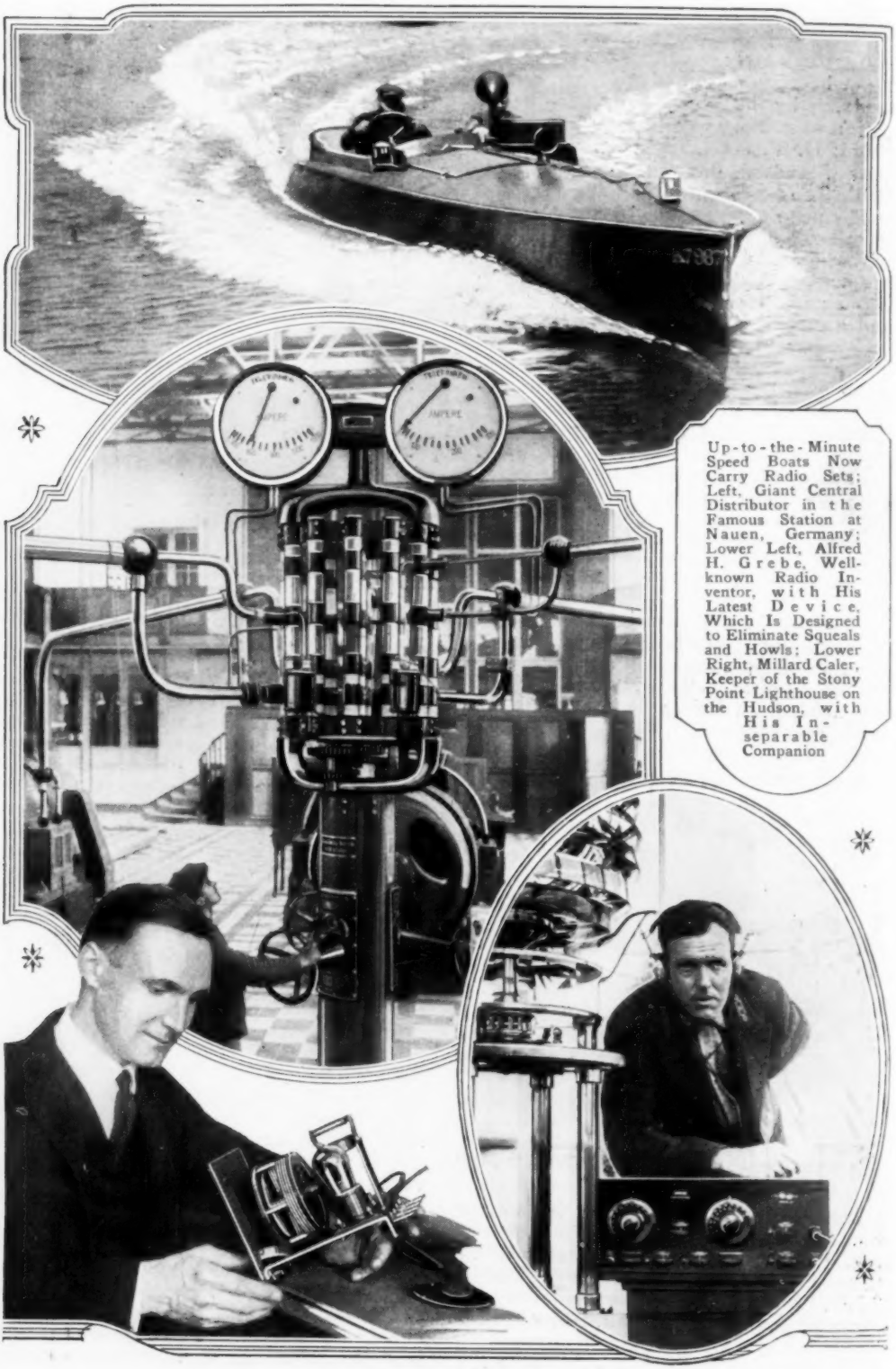
The Wedding Ceremony of Wendell Hall, Well-Known Radio Singer, and Marion Martin, Which Was Broadcast from WEAF

Radio Carries Heart Throbs to 750 Physicians

Seven hundred and fifty stethoscopes, connected by radio, enabled as many physicians to study the heart beats of one patient in the lecture hall on the Municipal Pier, Chicago, at the recent convention of the American Medical association.

The essential part of the apparatus was an amplifier, designed for three stages of amplification of the current changes in a very sensitive transmitter. Three-element vacuum tubes were used, as in the ordinary receiver and transmitter. Radio earphones were used, but each physician brought his own stethoscope, which he held against the phones.

The listeners said that this device will enable a whole class of medical students to study heart action simultaneously.



Up-to-the-Minute Speed Boats Now Carry Radio Sets; Left, Giant Central Distributor in the Famous Station at Nauen, Germany; Lower Left, Alfred H. Grebe, Well-known Radio Inventor, with His Latest Device, Which Is Designed to Eliminate Squeals and Howls; Lower Right, Millard Caler, Keeper of the Stony Point Lighthouse on the Hudson, with His Inseparable Companion

Above, Miss Virginia Smith, Star of "Lollipop," Knows a Lot about Dancing, but the Radio Keeps Her from Slipping by Supplying Her with Music at Home; Upper Right, a Combination of Outboard Motor and a Radio Set Spells Happiness for the Vacationist; Right, Mme. Georgette LeBlanc Accompanies the Broadcast Songs of Her Friends; Below, "Uncle" Phil Schwartz and Jerry Sullivan of WQJ

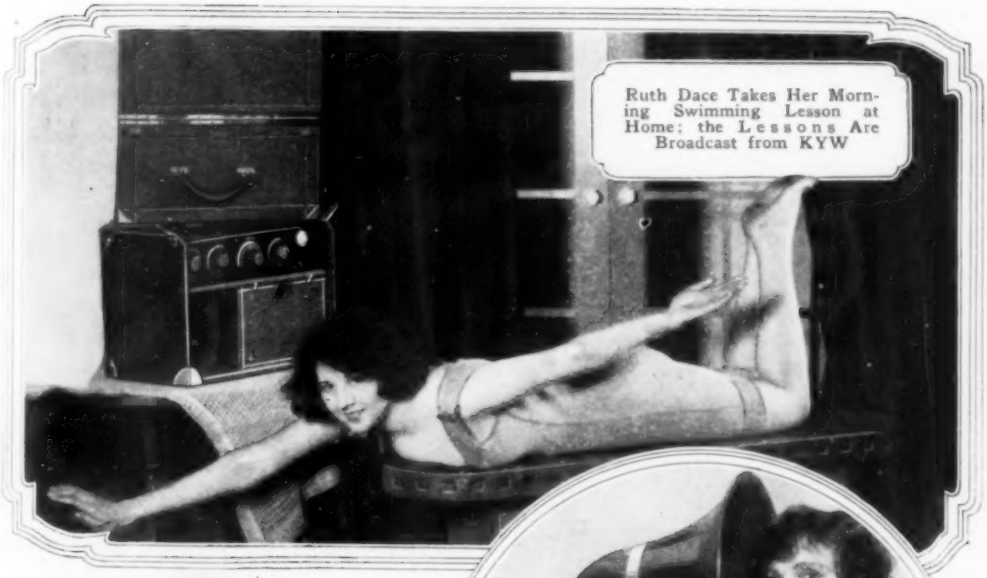
© U. & U.

Bonnie MacLeary, Well-Known American Sculptress, Amuses Her Little Subject in the Modern Way

James J. Davis, Jr., the Country's Youngest Broadcaster ©

Waiting for the Races to Start at Belmont Park, Jockey Burns Tunes In for His Friend Thurber

Miss Margaret O'Neil Makes Her Set Fit for the Boudoir

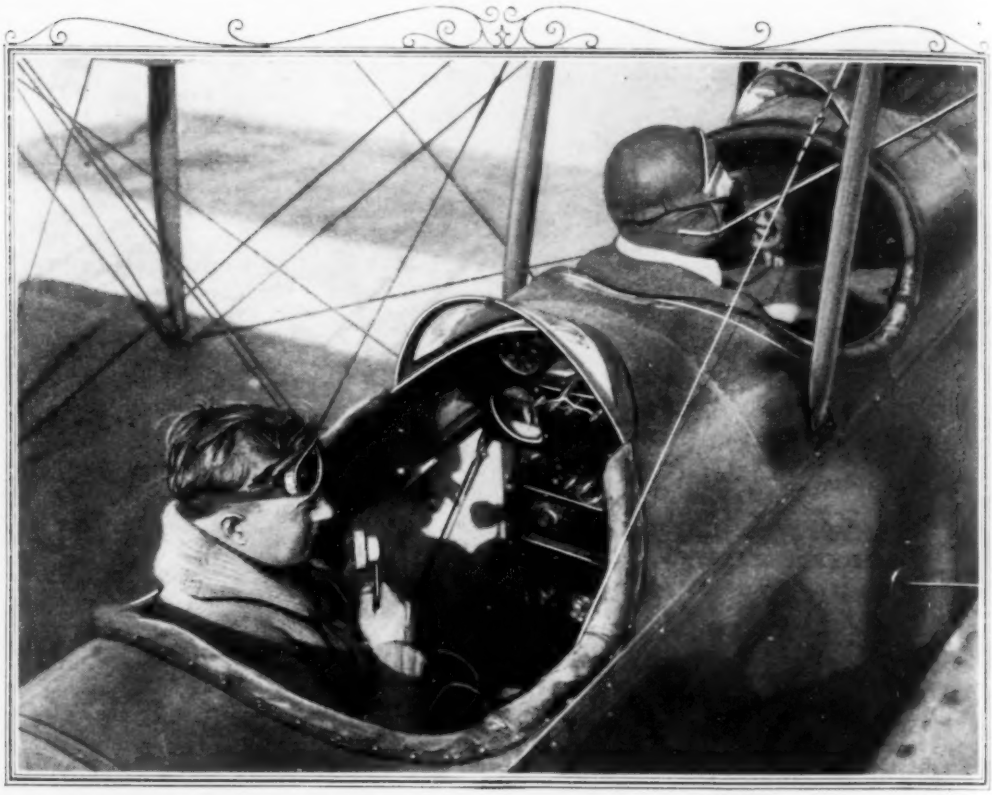


Ruth Dace Takes Her Morning Swimming Lesson at Home; the Lessons Are Broadcast from KYW

Marie Conkwright Charms Her Pet Snake by Radio

Radio Is Even Replacing the Cookbook in the Modern Kitchen: Ann Stanford and Lillian Klein Making Candy to a Radio Recipe

Jocko, Stable Mascot at Jamaica Track, Takes a Lesson in Listening In

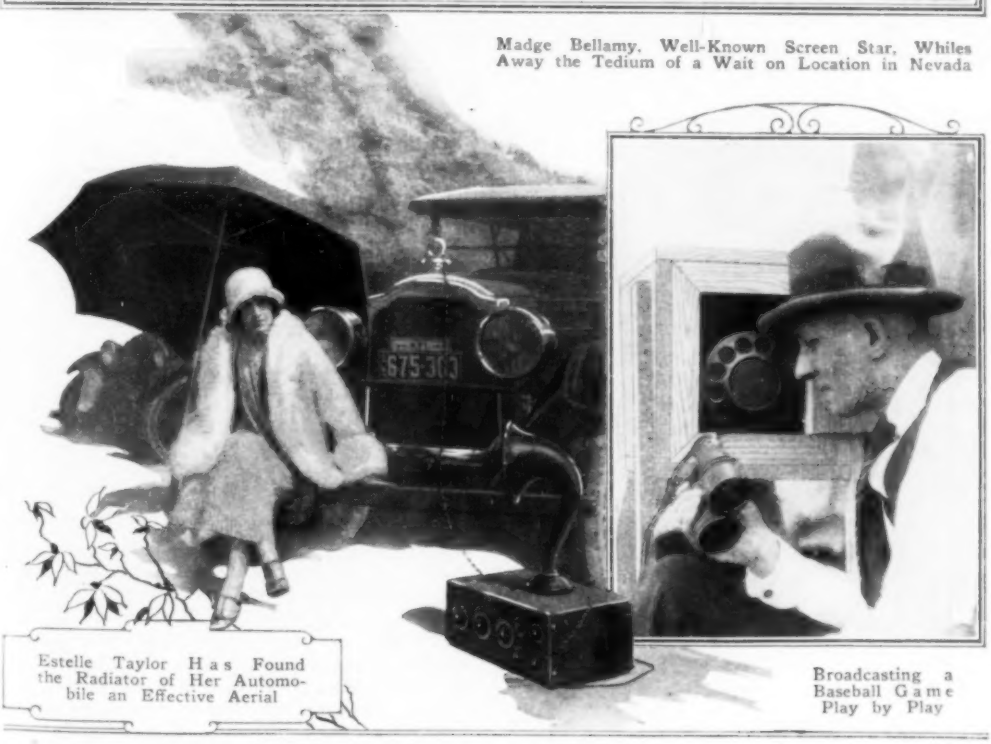


Captain Brower, Former War Ace, Pilots This Plane While a Radio Engineer Broadcasts a Talk on Army Life from the Sky in New York City

This Is Not a Coil for a Set, but a Very Efficient "Spider-Web" Aerial

Radio Pinch-Hits for Orchestra While Jane and Eva Novak Register Sisterly Affection

Madge Bellamy, Well-Known Screen Star, Whiles Away the Tedium of a Wait on Location in Nevada



Estelle Taylor Has Found the Radiator of Her Automobile an Effective Aerial

Broadcasting a Baseball Game Play by Play

Making a Push-Pull Amplifier

By F. L. BRITTIN

BUT a short time ago it was generally admitted that amplification beyond two stages was not desirable, as the third step would amplify tube noises, and distort the signals to a point where the tone quality was lost. A few experimenters obtained fair results with the third stage, but these were the exception rather than the rule. The addition of the push-pull amplifier to the ordinary audio-frequency amplifier solves the problem in a very simple manner, reproducing the signals with greater volume, but without distortion. This amplifier operates on both halves of the cycle of alternating current passing through the audio-frequency transformers, the two tubes sharing the load equally. Until recently the transformers necessary for this purpose were not available, but there are now a number of good ones on the market.

The two tubes used may be either UV-201A or C-301A; these are practically placed in parallel, as their grid terminals are connected to the opposite ends of the secondary winding of the input transformer. It will be noted that one transformer is marked "input," the other

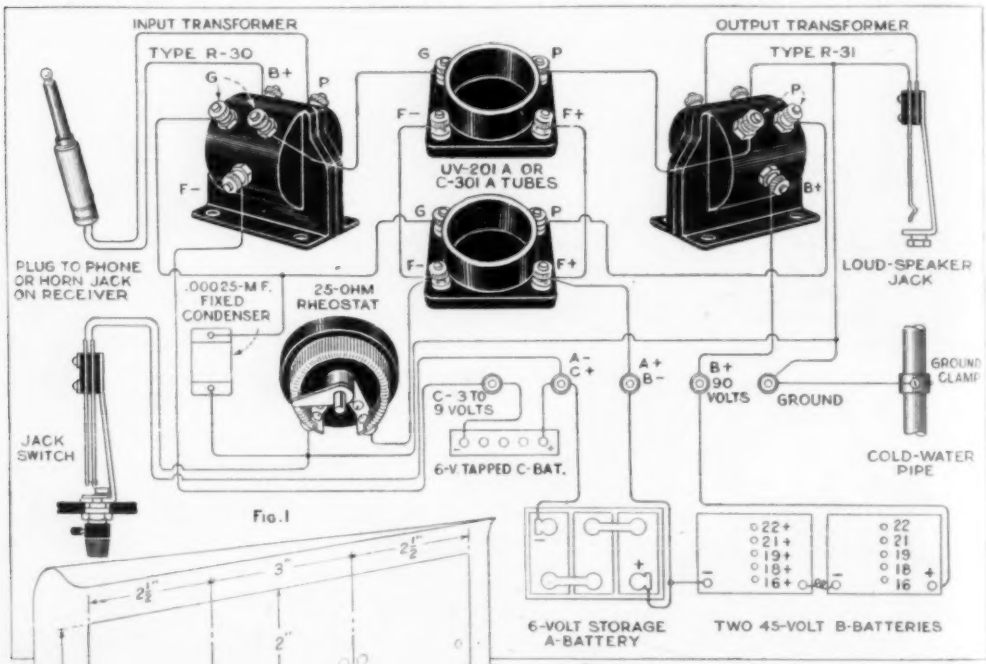


Fig. 1

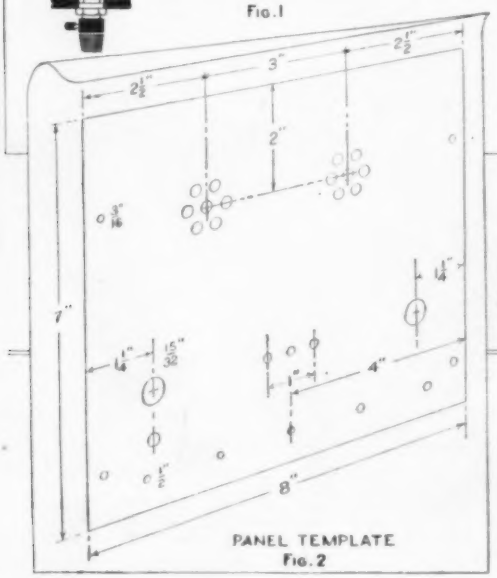


Fig. 2

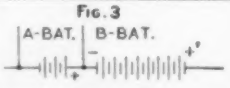


Fig. 3

USE SAME A AND B-BATTERIES FOR POWER AMPLIFIER IF YOUR CIRCUIT IS CONNECTED A+ TO B-

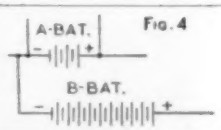


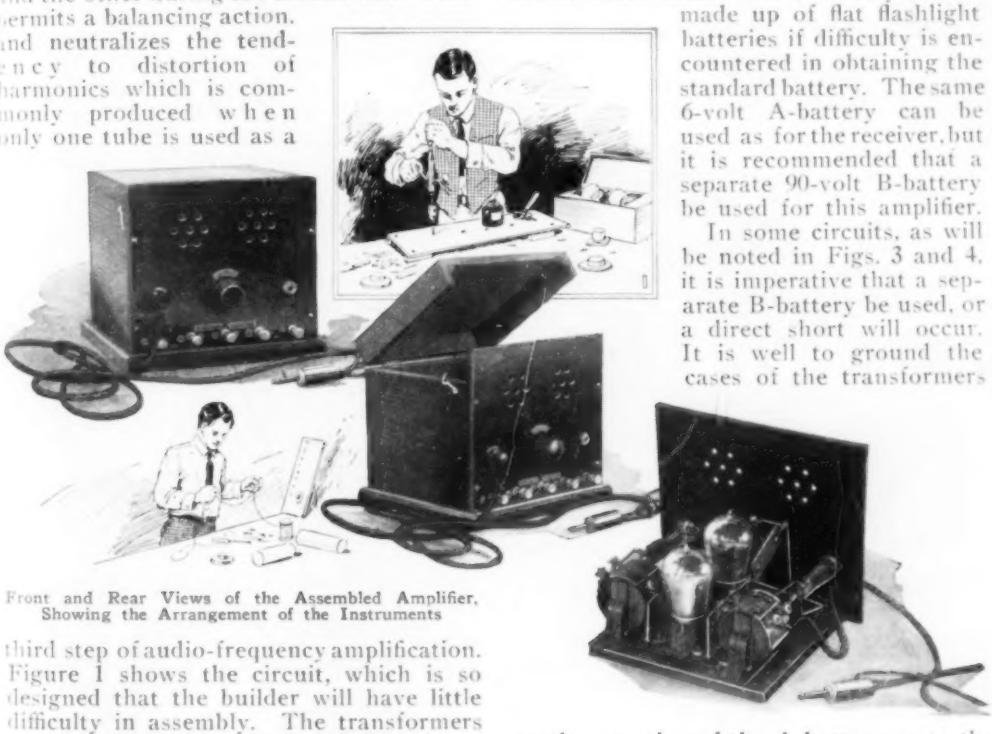
Fig. 4

USE SEPARATE B-BATTERY FOR POWER AMPLIFIER IF YOUR CIRCUIT IS CONNECTED A- TO B-

Details of the Push-Pull Amplifier Circuit, with a Drawing of the Panel Template, and Hookups Showing How to Connect the Amplifier

"output." The input transformer has, of course, a primary winding. The feature of the input transformer lies in the fact that it has two secondary windings with a common terminal, which connects with

the negative filament through the C or grid-biasing battery. The other ends of the double winding are used as the grid terminals in this particular transformer. The secondary winding is often referred to as a "split" winding, and sometimes has a center tap which serves the same purpose as the common terminal. The advantage of the double winding is that the impedance will be equal in both, which serves to maintain the balance action described later. The electromotive force applied to the grids of the two tubes is exactly 180° out of phase; in other words, one tube is in operation during one half of the cycle and the other during the second half. This permits a balancing action, and neutralizes the tendency to distortion of harmonics which is commonly produced when only one tube is used as a third step of audio-frequency amplification. Figure 1 shows the circuit, which is so designed that the builder will have little difficulty in assembly. The transformers are mounted on a ⅜ by 6½ by 7-in. baseboard. The panel is of bakelite or formica, 3/16 by 7 by 8 in. in size. Drill the panel according to the template shown, and mount the rheostat, phone jack and binding posts on it. The on-and-off jack switch can be omitted if desired, as most rheostats have an off point on them. When the transformers and tube sockets have been screwed to the base, the latter can be screwed to the panel with two round-head nickelplated screws. The wiring is then soldered in place, care being taken to keep the leads as short as possible. Use only good parts, and carefully solder all joints. Do not solder the wire directly to the transformer terminals, however; use lugs under the terminals, and solder the wire to the lugs. This also applies to the tube sockets, and is a good plan to follow wherever lugs can be used, as at the terminals of the grid condenser, etc. The grid and plate lead especially should be as short as possible, to eliminate local feed-back effects.



Front and Rear Views of the Assembled Amplifier, Showing the Arrangement of the Instruments

Under ordinary conditions 90 volts will be found best for the plate potential (this, of course, refers to the B-battery). It is necessary to have a C-battery, and for the tubes specified a 6-volt battery is used. These batteries are provided with taps and the voltage can be varied to suit the particular tubes used. The C-battery can be made up of flat flashlight batteries if difficulty is encountered in obtaining the standard battery. The same 6-volt A-battery can be used as for the receiver, but it is recommended that a separate 90-volt B-battery be used for this amplifier.

In some circuits, as will be noted in Figs. 3 and 4, it is imperative that a separate B-battery be used, or a direct short will occur. It is well to ground the cases of the transformers to the negative of the A-battery or to the ground.

The panel, base and cabinet can be any size elected, the sizes given being those used by the author, with a 6¾ by 7¼ in. (inside measurements) cabinet. A good feature of this hookup is the phone plug in the input circuit, which permits the placing of the amplifier immediately after the detector, first or second stage of audio-frequency amplification.

An increase in amplification proportionate to that attained by two more steps of audio-frequency amplification arranged in the common manner cannot be expected. The push-pull amplifier gives an increase in audibility slightly over that of

one tube. This amplifier has been used with success in all types of circuits and is recommended wherever a third step of amplification is desired.

MATERIAL LIST

1 bakelite panel, 3-16 by 7 by 8 in.
1 baseboard, ⅜ by 6½ by 7 in.
2 UV-201A or C-301A tubes.
1 25-ohm rheostat.
1 .00025-mf. fixed condenser.
1 single open-circuit jack.
1 phone plug.
1 single phone cord.
1 jack switch (optional).
5 binding posts.
1 power-amplifying transformer, input type.
1 power-amplifying transformer, output type.
2 tube sockets.
3 lengths tinned-copper busbar wire.
2 B-battery units, 45 volts each.
1 C-battery, 6 volts.
1 cabinet, inside measurements, 6¾ by 7¼ in.

Large-size blueprints of this circuit have been prepared, and can be obtained, price 25 cents, by addressing the Book Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill. Ask for Radio Blueprint No. 2.

Selling Loud Speakers

Where a large number of different types of loud speakers are carried in stock, and a customer wants to hear all of them before making his selection, it is quite bothersome to connect and disconnect each one in turn. One salesman in a radio store solved this problem in an ingenious manner. He wired a receiving set to a small distributing board, mounted on a shelf that carried one of every type of loud speaker in stock. The loud speakers were wired to the board, and a switch, with contact points for each instrument, mounted on the latter. Now, with a turn of the switch knob, all the loud speakers may be put through their paces in turn.

Selling Loud Speakers Is Easy with This Fixture; All Are Played in Turn by a Flick of the Switch

Radio Industry Growing

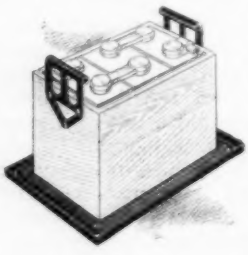
"On the basis of figures for 1923, it is probable that the American people will spend about $350,000,000 for radio equipment during the present year," says Roger Babson, noted statistical expert.

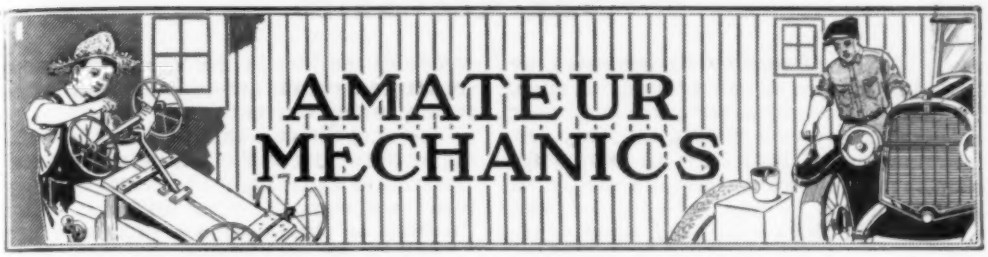
Mr. Babson goes on to say that a conservative estimate of the business in vacuum tubes alone is about $50,000,000, and that at least five times as much, or $250,000,000, will be spent for radio sets and parts. The sales of batteries will very likely amount to over $45,000,000, and miscellaneous equipment, such as loud speakers, battery chargers, etc., may easily account for $50,000,000 more.

Sales of radio equipment now are running nearly twice as large as on all classes of sporting goods. The value of radio business is also nearly twice as great as that of the carpet and rug business. For every dollar spent on furniture, 33 cents is spent for radio; for every dollar spent for boots and shoes, 25 cents is spent for radio, and for every dollar spent on musical instruments of all kinds, including pianos, phonographs, etc., 75 cents is spent for radio. These illustrations emphasize the growing importance of radio from a business standpoint.

Rubber Mat for Storage Battery

Leaky storage batteries often cause damage to rugs and varnished floors, due to the action of the sulphuric acid contained in the electrolyte. To eliminate this trouble heavy rubber mats of the kind shown in the illustration have recently been put on the market. The battery is placed on the mat and any electrolyte leaking out will be retained on it. It is shaped like a tray and is deep enough to hold all the electrolyte contained in one storage-battery cell of average size. The bottom is formed in a series of narrow ridges and grooves, to increase the capacity of the tray without making it clumsy.



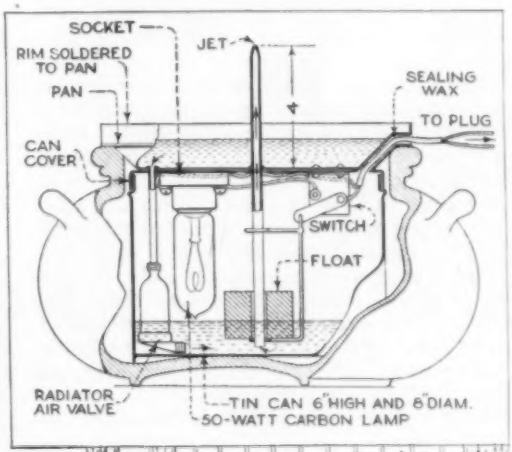


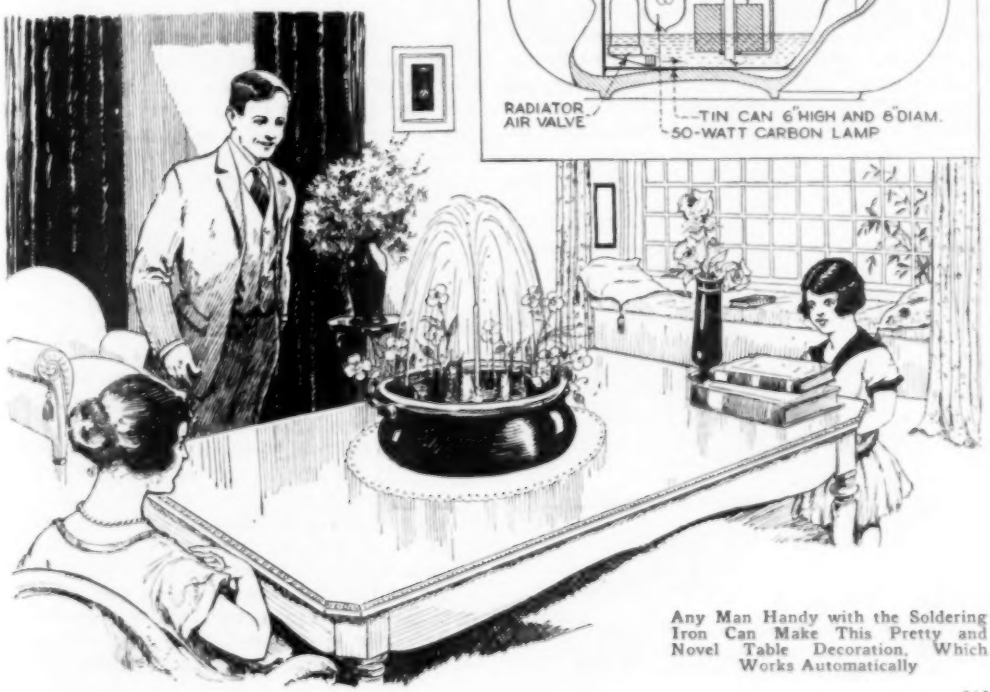
How to Make a Table Fountain

By THOS. W. BENSON

A SMALL table fountain that works automatically can readily be made by anyone capable of using a soldering iron. The finished apparatus is very pretty in operation, and also serves to humidify the air. By adding perfume to the water, it acts as a deodorizer also, and all told, it makes a novel table-decoration well worth making. The "works" of the fountain are inclosed in a tin can, 8 in. in diameter and 6 in. high. The dimensions can be varied somewhat, but the maker should not attempt to construct one much larger than that described. The principle of operation is as follows: The lower chamber is air-tight, and contains a carbon-filament electric lamp; when the lamp is lighted, it heats the air and forces the water up through the jet; this lowers the water level and the float falls, opening the switch and cutting off the light. As the air in the container cools, a partial vacuum is formed, and water flows down the tube and through the valve on the left until the float rises and switches on the light again, thus causing the operation to be repeated.

The tin can used for the lower chamber should have a tight-fitting cover, and a pie plate is soldered to this as shown; the





Any Man Handy with the Soldering Iron Can Make This Pretty and Novel Table Decoration, Which Works Automatically

depth of the plate may be increased by soldering a strip of tin around its edge. Through the center of the plate and cover is passed a copper tube 9½ in. long. At the upper end of this a jet is made by plugging the tube with solder and drilling a 1/32-in. hole. If desired, a 1/64-in. hole can be drilled in the center, and three other holes of the same diameter drilled at an angle to spread the spray. The pipe is soldered securely where it passes through the plate and cover.

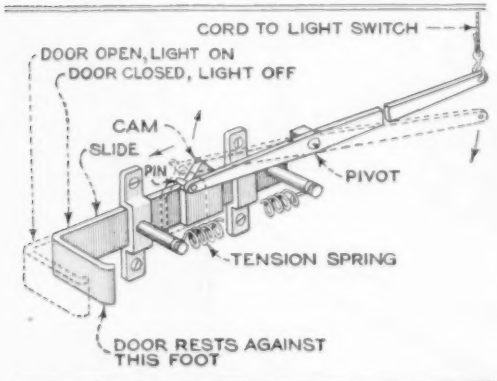
A short piece of tubing is soldered into the bottom of the plate and cover to serve as a return pipe, and this must be fitted with a check valve. The simplest form is an old radiator valve, soldered to the end of the tube, and with the end just reaching the bottom of the can. The wires are led in through a tube soldered along one slanting edge of the plate and through the can cover, as shown. A porcelain socket is used for the lamp; it is bolted to the can lid and the heads of the bolts covered with solder.

The switch is simply a strip of brass, pivoted at one end and with a hole drilled at the other. This strip is mounted on a hard-rubber or bakelite strip, and a contact is so arranged that the circuit will be closed when the strip is pushed up. The float may be one taken from an old carburetor, or made from a small tin can with the lid soldered on tight and a tube soldered through the center. It slides on the lower end of the jet tube, and plays between two pieces of heavy brass wire bent to fit loosely around the jet. The lower one is bent to form a vertical arm, as shown. The upper wire is soldered to this arm at a point determined as described below, and the assembly connected to the switch by simply bending an eye in the end to fit the hole in the lever. The lamp socket and switch are connected in series to the supply current.

The only difficult thing about the making of the device is the setting of the float. Determine how high the float rides in water, and mark the water line on it. Place the float on the jet tube with the bottom ½ in. from the end of the tube, and adjust the wire so that the switch is ¼ in. open. Determine by measurement just how high the water must be in the lower chamber to hold the float in this (its lowest) position, and pour water into the chamber to that depth. Fill the top reservoir two-thirds full of water, and pour it into the lower chamber. Now raise the switch lever until connection is established between the contact point and the lever; then solder the looped top wire to the vertical branch of the lower one, level with the top of the float. By this means the travel of the float is limited between the off and on positions of the switch. The quantity of water need not necessarily be limited to the amount stated, however, for the upper loop can be soldered to the lower one at a higher point, provided always that the lamp bulb does not come in contact with the water and that the total quantity of water that can be ejected does not exceed the capacity of the pie pan.

The cover may now be pushed on tightly and the current turned on. In less than a minute the water will begin issuing from the jet, and it will continue to flow for 10 to 15 minutes according to the size of the jet. The flow will then stop, and after a short period will start again.

The can may be decorated in any manner desired, and a tiny rockery can be built up around the jet, using small pebbles. The can may also be set in a large flowerpot as shown in the illustration.



Attachment for Operating Electric Garage Light Automatically by Opening and Closing Door

Automatic Switch for Garage

Being well versed in the art of forgetfulness, the writer installed an attachment to his garage door so that the electric light is automatically turned on when the door is opened and off when it is closed, thus reducing the lighting bill.

A strip of iron, ⅛ in. thick and 1 in. wide, was bent to the shape of the letter "L" and fastened to the inside of the wall with cleats, which permitted it to slide easily. This slide has screwed to it on the top edge a triangular cam and it also carries a pin at the end, which is connected by a coil spring to another pin on the first cleat. The spring pulls the slide forward. A lever is pivoted at its center on the wall

in the position indicated so that a pin provided at one end rests against the cam on the slide, and the other end is tied to the cord of a pull-chain socket. When closed, the door rests against the foot of the slide keeping it pushed in and when the door is open the spring pulls the slide out. The action of the slide moving in and out makes the pin on the lever ride over the triangular cam, which causes the other end of the lever to move up and down and pulls the light on and off. The width of the cam should be equal to or less than the distance between the rear pin and the nearest cleat, when the slide is pushed in.—R. H. Kasper, Philadelphia, Pa.

Sanitary Fountain for Windmill Pump

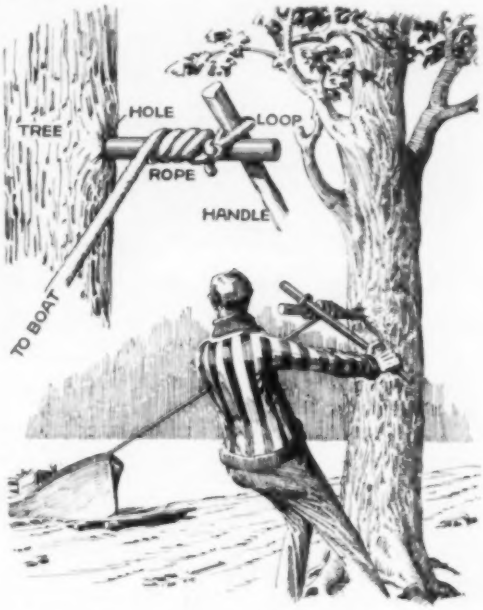
The insanitary practice of having a common drinking cup at the windmill has been abolished by a Wisconsin farmer who substituted a bubbling fountain of the kind shown in the drawing. The pipe from the windmill to the stock-watering tank was 1¼-in. in size and had a 12-in. drop. At the lower end, near the tank, a tee and a long nipple were inserted in the pipe and an old harrow disk fastened on to serve as a bowl. A U-shaped assembly of ½-in. pipe was arranged inside the larger pipe, as shown in the drawing, to catch part of the water running to the tank. This water

Simple Bubbling Fountain for Windmill Pump Eliminates the Common Drinking Cup

comes bubbling up out of the smaller pipe and flows into the bowl, which has holes drilled in the bottom near the center so that the water returns to the larger pipe. —G. E. Hendrickson, Argyle, Wis.

Pulling Motorboat on Beach

At a summer cottage, where a regular dock is not available and where the only safe method of "docking" a boat for the night is to drag it up on the beach, the



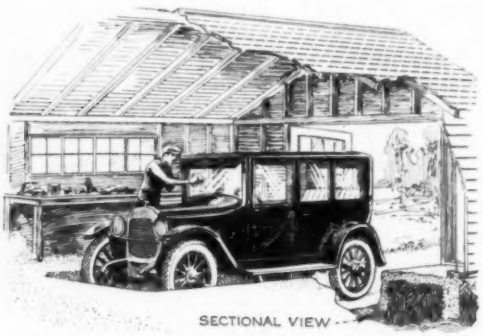
Use of Winch Enables One Man to Pull a Heavy Motorboat onto Beach

usual method of doing this is generally too much for one man; he can easily do it alone, however, by using a simple winch of the kind shown in the drawing. A point on the beach near a large tree is selected as a landing place. A deep hole is drilled into the tree, to receive a length of large pipe or heavy steel rod. If available, a piece of an automobile axle will do. A strong rope is tied to the prow of the boat and a loop is tied at the other end. By slipping a stout piece of lumber, or a crowbar if handy, through the loop and twisting the rope around the pipe as shown, the boat will be slowly pulled up on the beach. Skids under the boat will reduce friction and prevent damage to the bottom of the boat. This method has been used in actual practice and found entirely satisfactory.—Earl Tyre, Jacksonville, Fla.

A dash-lamp socket, screwed to the front of the dash under the hood, and wired into the regular lighting circuit, serves two purposes: It provides a place to carry a spare bulb without danger of breaking, and provides a light over the engine, in case of trouble at night.

Novel Garage Floor

A Washington car owner has a rather novel floor in his garage, one that gives all



An Unusual Garage Floor, Which Is of Advantage in Cleaning the Car

the advantages of a pit, with several additional good features.

The sides of the floor are elevated above the remainder, to a height of about 12 in., thus forming what amounts to a depression in the floor, extending to within about 4 ft. of the walls. The depressed space is just long and wide enough to accommodate the car, which is a sedan. This places the working floor of the garage only a small distance below the running boards and several inches below the car axles; which is of particular advantage in cleaning a closed car, where it is necessary to wash windows, clean the top, and polish the paint. Drainage of wash water is also better, and the person cleaning the car is out of the way of water dripping from the body to the floor.

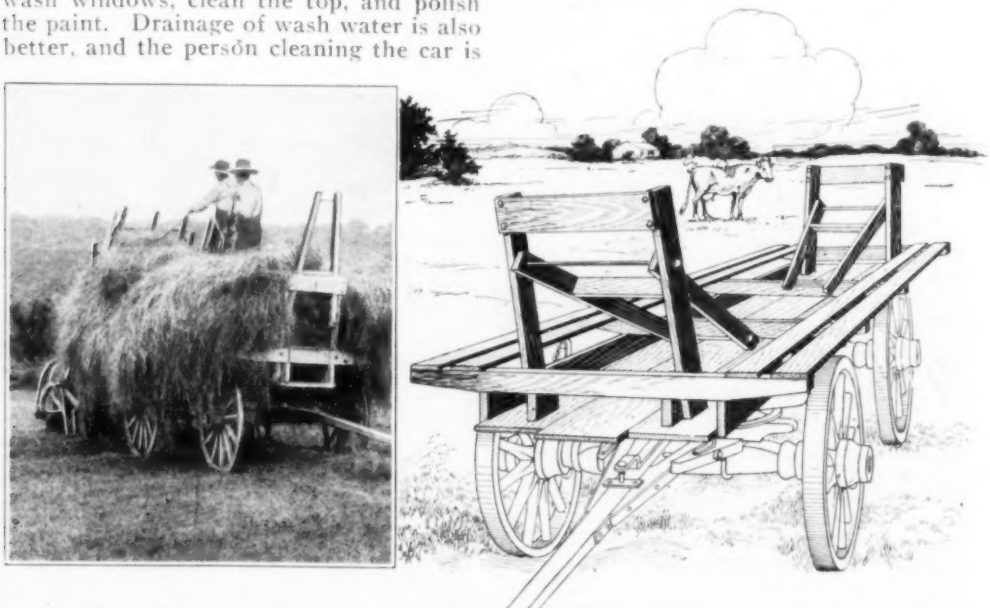
While it is not so convenient to get under the car as with a common floor, yet, by jacking up the car, it is easy to support it by stout transverse beams, resting on the side platforms, and this gives a liberal working space underneath. It would be well, before making a floor of this kind in a garage, to find what the state law is with regard to pits in garages, as this construction may be held the same in effect as a pit.

Decorative Push Plates

A clever decorative touch can be given to the swinging door between the dining room and kitchen by putting a piece of the dining-room wall paper under the glass push plates. This is particularly effective on a door painted ivory or white.—A. May Holaday, San Jose, Calif.

Folding Hayrack Ladders

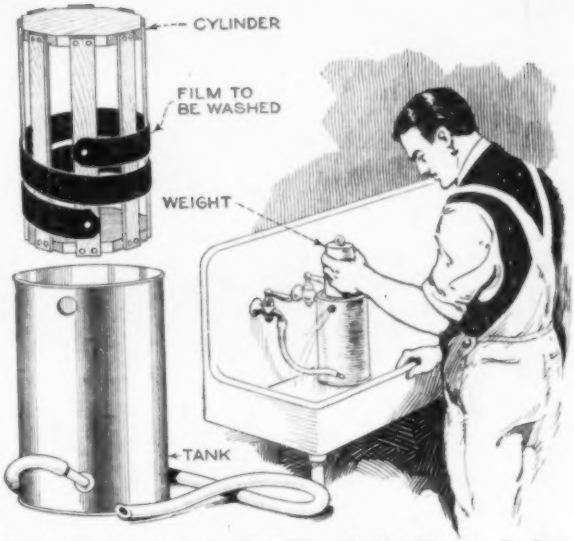
On the old-style hayrack the high end ladders have to be removed when the wagons are driven through orchards, under low trees, or when a hay loader is used. Ladders of the kind shown in the drawing, therefore, have many advantages over the stationary type as they can be folded down whenever necessary. As the front ladder can be placed up when loading, its folding part may be made higher than the rear one.



Folding End Ladders on the Hayrack Are of Considerable Convenience When Using a Hay Loader or When Passing through Orchards

Washing Tank for Roll Films

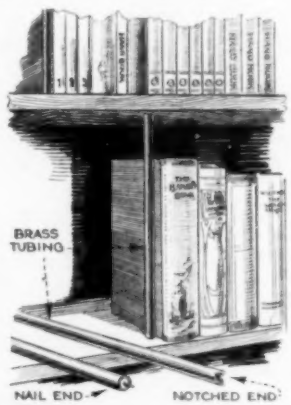
With the aid of the tank shown in the illustration roll films can be washed in one-fourth of the time otherwise required. It is made of galvanized iron, copper or brass, and is about 8 in. high and 4 in. in diameter. A small overflow hole, about 1½ in. in diameter, is cut 1 in. below the top, and a short copper nipple is soldered in near the bottom, so that a length of rubber hose from the water faucet can be attached to it. The nipple is set at an angle so that the water entering the tank will flow with a swirling motion, giving an ideal circulation for washing purposes. The film is held on a wooden frame, as detailed at the upper left in the drawing, the endpieces being cut octagonal and 3/16-in. strips nailed to the edges. The frame must, of course, be of smaller diameter than the tank so that it will fit loosely inside of the latter. The film is wound around the frame, as shown, with the emulsified surface on the outside, and the ends are fastened by means of thumbtacks. Several films may be treated at the same time, if they are not too long. Films from packs also can be washed by tacking each film separately to the frame. As the frame has a tendency to turn or rock owing to the strong circulation of water, and as the films thus might be scratched, it is advisable to attach a weight to the bottom, or set one on top, so that it is held immovable. —John T. Daniel, San Francisco, Calif.



Handy Washing Tank for Roll Films Enab'es Work to Be Done in Fraction of Time Usually Required

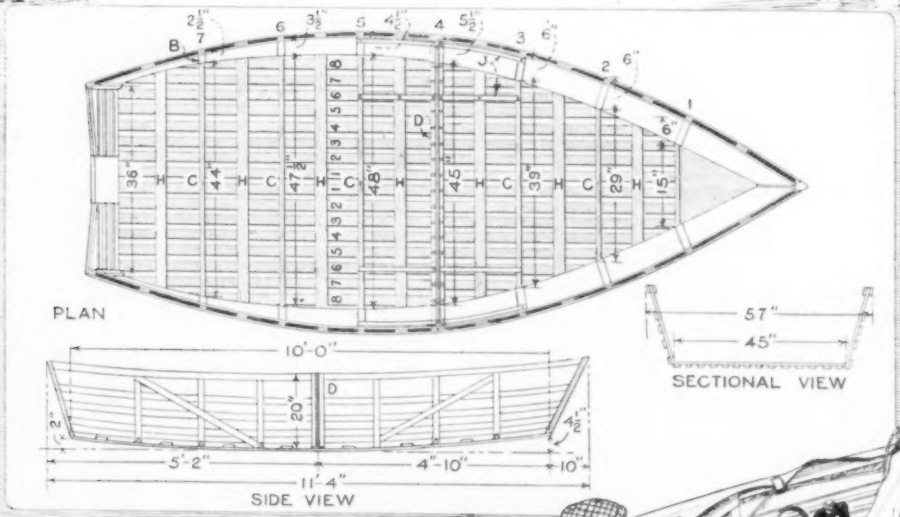
Supporting Sagging Bookshelves

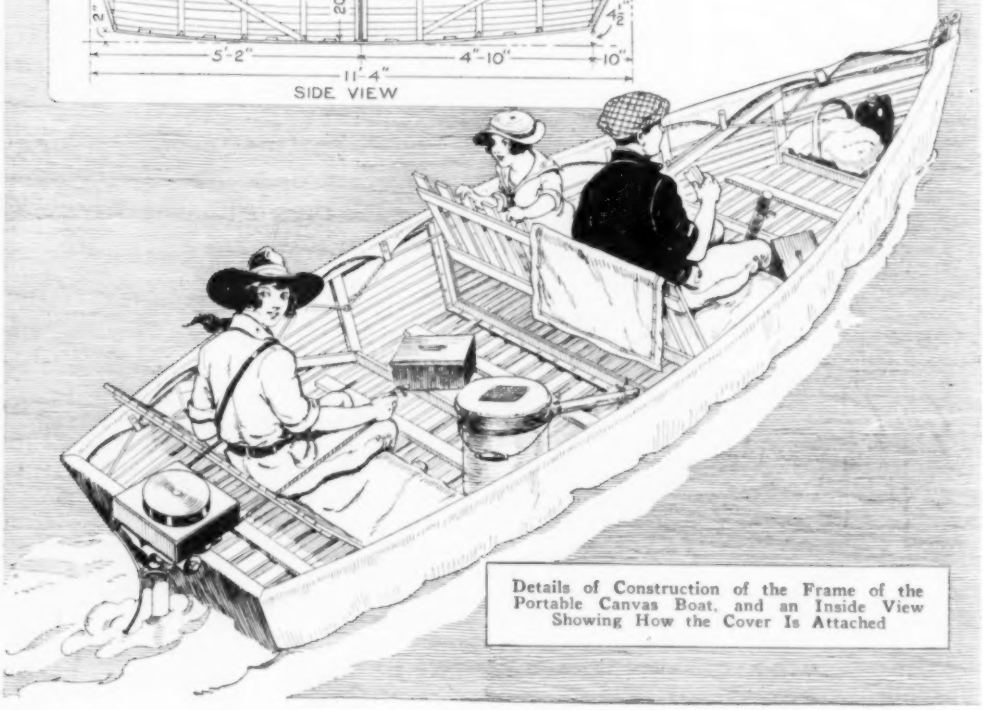
Long bookshelves are prone to sag at the middle, and this looks very untidy. To prevent this sagging, a neat and self-supporting strut can be made from a brass tube; it will need no nails or screws for fitting and can be removed at any time without leaving any ugly marks. A brass tube, about 3/8 in. in diameter, is cut to the proper length, and the ends squared. The ends may then be treated in two different ways to make them self-locating. The first method is to fit a wooden plug in one end, then to drive a nail into the plug, cut the head off, and sharpen the projecting point, which should be about 1/8 in. long, with a file. To fit: lift the upper shelf and place the strut in position; when the shelf is released the weight of the books will force the point into the lower shelf. The second method is even more simple; here a file cut is made across the end of the tube, leaving two sharp points. Being of brass, these struts look much neater than wooden ones, and they can be removed and replaced at any time.



Emergency Tire Patch

One night after discovering a flat tire I removed the casing and inner tube to repair the leak, and then found that I had no cement. Being a long distance from any auto-supply store I faced the necessity of driving along on the rim. But, finding a small roll of electrician's friction tape in the toolbox, I wound several layers of it around the tube and found it held as well as a patch. With this temporary repair, I rode around for two weeks before applying a regular patch.—Louis Latour, Plattsburg, N. Y.





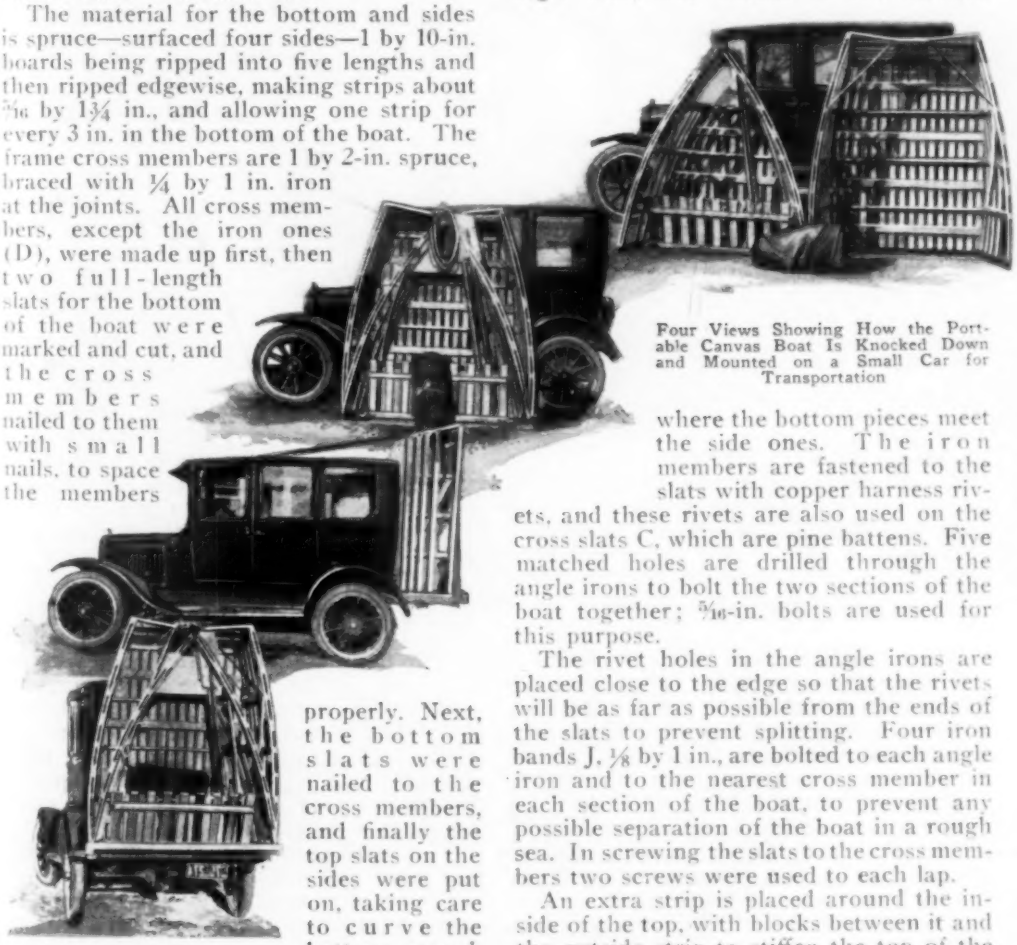
Details of Construction of the Frame of the Portable Canvas Boat, and an Inside View Showing How the Cover Is Attached

Building a Portable Canvas Boat

By D. M. SPENCER

THE portable canvas-covered boat described in this article can be built by anyone at all handy with tools, and will prove an ideal craft for hunters and fishermen, especially those living at a distance from lakes and streams, so that they cannot keep a boat permanently in the water. As the total weight of the boat, including engine and battery but without fuel, is only 225 lb., it can easily be carried on the back of a small car.

The material for the bottom and sides is spruce—surfaced four sides—1 by 10-in. boards being ripped into five lengths and then ripped edgewise, making strips about 5/16 by 1¾ in., and allowing one strip for every 3 in. in the bottom of the boat. The frame cross members are 1 by 2-in. spruce, braced with ¼ by 1 in. iron at the joints. All cross members, except the iron ones (D), were made up first, then two full-length slats for the bottom of the boat were marked and cut, and the cross members nailed to them with small nails, to space the members properly. Next, the bottom slats were nailed to the cross members, and finally the top slats on the sides were put on, taking care to curve the bottom enough so that these would lie flat and true, as the flare of the sides governs the curve of the bottom. The corner pieces for the stern and bow are of 2 by 2-in. stock, cut to fit the angles. When all the slats were nailed on with small nails, they were all screwed to the cross members with No. 9 flat-head brass screws, preparing the holes for the screws with two drills and a countersink to prevent any possibility of splitting. The boat frame was next sawn in two at D, and the iron cross members put on; these were made of ⅛ by 1½-in. angle iron, and welded at the corners where the bottom pieces meet the side ones. The iron members are fastened to the slats with copper harness rivets, and these rivets are also used on the cross slats C, which are pine battens. Five matched holes are drilled through the angle irons to bolt the two sections of the boat together; 5/16-in. bolts are used for this purpose.



Four Views Showing How the Portable Canvas Boat Is Knocked Down and Mounted on a Small Car for Transportation

The rivet holes in the angle irons are placed close to the edge so that the rivets will be as far as possible from the ends of the slats to prevent splitting. Four iron bands J, ⅛ by 1 in., are bolted to each angle iron and to the nearest cross member in each section of the boat, to prevent any possible separation of the boat in a rough sea. In screwing the slats to the cross members two screws were used to each lap.

An extra strip is placed around the inside of the top, with blocks between it and the outside strip to stiffen the top of the boat. The remainder of the bracing is quite clear from the drawings. The covering is 20-oz. double-filled waterproofed duck. It

must be well shrunk before cutting to fit the boat, and it should not be cut to fit too tight. The seams are all triple-sewn, and a reinforcing strip is sewed to the bottom edge around the front of the boat. Steel rings or canvas loops are riveted to the top edge of the cover, spaced halfway between the cross members, and hooks are placed 6 in. down on the vertical side members of the frame. The cover is laced to the boat by means of these hooks and rings, using good flexible rope for the purpose. The seats are easily fitted, and this detail can be left to the prospective builder. The back seat, however, should be fitted into notched blocks, or mounted in some other convenient manner, so that it can be removed and the front section nested into the rear for transportation. The two sections of the boat weigh 64 lb. each, and the cover 21 lb.; with my wife's help I can remove the battery, cushions, gas can, etc., from the boat, unbolt it, and mount it on the back of the car in 15 minutes. It makes about six miles an hour with two passengers, and I have had it in a rough sea, where it proved steady and safe. It might be well to add that one should carefully inspect the cover for rips or tears before launching the boat into the water.

Two Views of the Completed Boat Afloat and Ready for Business

Finishing Yellow-Pine Floors

When building a new house, if one does not care to use the more expensive solid oak for floors and finish, yellow pine that is well seasoned and dressed and properly oak-stained will make a pleasing substitute. It has a beautiful grain and is soft and porous enough to take stain well.

The floor must first be well dressed down and an oak-paste filler that dissolves in gasoline is then applied. Enough of the paste is dissolved to get the desired shade, which can be determined by trying it out on some waste pieces of the pine. A can of paraffin oil is obtained for polishing. Start in one corner of the room, beginning with four flooring boards at a time. Flow the stain on with a wide brush, wipe quickly and then apply the paraffin oil to polish it; rub in all the oil that the wood will absorb, but no more. The work must be done rapidly in order to get a glossy finish. All the stain must be wiped off before the oil is applied, otherwise there will be a greasy finish. The oil can be applied conveniently by means of a flannel cloth saturated with it.

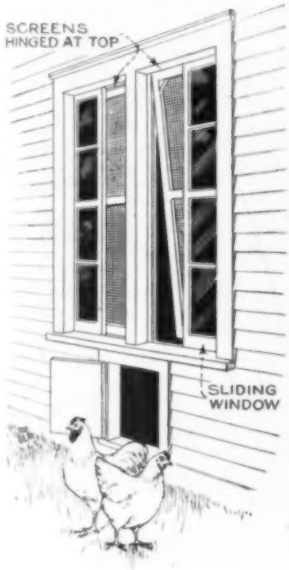
The work should always be done with the grain and not across it, as the finish will then be messy. Do not attempt to take more than three or four flooring boards at once or the stain already applied will dry before the next lap is covered. After the coat of stain and oil has been applied, use a heavy floor polisher to

rub in more oil—all that the wood will take up—but leave absolutely no excess on the floor. If a regular floor polisher is not at hand, a serviceable substitute can be made by padding the stub of an old broom, and fastening a piece of clean carpet over it.

A floor finished in this way will stand very rough usage and will last a long time, actually improving in appearance with age. In addition it is easily repaired. If, for instance, a piano is moved over it, leaving a track in the soft wood, this track can easily be removed by sandpapering, staining to match the rest and oiling. For cleaning the floor, which is occasionally necessary, use soap and water, then touch up any light spots with stain, and polish the surface again with paraffin oil.—G. O. Anders, W. Lafayette, Ind.

Convenient Poultry-House Window

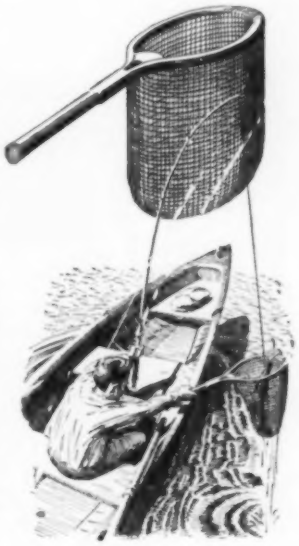
In large poultry houses, where maximum light and adjustable ventilation are desired, the sliding-window and hinged-screen arrangement shown in the illustration will be found convenient. The windows are built in pairs so that the sash can be slid in opposite directions. Any size window can be used, but in most cases 12-pane windows will be found most suitable. The screens are arranged behind the windows on the inside; they are hinged at the top so that they can be swung up against the ceiling and hooked there, thus giving free access to the interior. A lock is provided on the lower edge of the screens on the inside so that they cannot possibly be opened from the outside.



¶To clean japanned trays, rub them with a mixture of vinegar and powdered whiting, applied with a soft flannel; wipe off with a clean cloth and polish with chamois.

Novel Landing Net

It is unnecessary to purchase a landing net when one that is just as satisfactory can be made in a few moments' spare time. It consists of a discarded tennis racket and a piece of seine or netting, or a net knitted out of fish cord—if a fisherman lives near by who is willing to show how this is done. The gut strings are first cut out of the racket and the holes in the frame cleaned out to permit the cord to be pushed through. The net is gathered up as desired, and the ends are tied to the frame through the holes. The frame is given an application of spar varnish to protect the wood from the water. —Dale R. Van Horn, Walton, Neb.



Handy Milk-Card Box and Indicator

It is customary to put order tickets for milk and cream out on the porch, exposed to rain and snow. A better method is to use a card holder of the kind shown in the illustration; this card is practically weatherproof and its use is much easier than writing the order down. The card is circular and has lead letters and figures at top and bottom, as shown, to indicate the number of bottles wanted by means of two hands pivoted at the center. The whole is mounted on the front of a box in which the milk-record card is kept. When the cover is raised, it serves as a back rest for the card while the milkman is marking the amount of milk and cream delivered.—M. E. Duggan, Kenosha, Wis.

Convenient Feeding Trough for Hogs

By arranging hinged gates over the feeding troughs for hogs, as shown in the

Gates on Feeding Troughs Keep Hogs Out until Troughs Are Filled

photograph, it is possible to put in feed or slops without interference from the hogs. The troughs are built in pairs and extend into the hog yard, as shown, a section being cut out of the fence and a gate fitted to permit easy access between them. The space at the other end is closed. The gates, which can be swung in or out to open or close the troughs, are made of 1-in. boards, cleated together and hinged to a 2 by 6-in. board. A strap-iron handle, bent as shown, is bolted to the inside of each gate. It is hooked over, or braced against, the edge of the trough to keep the gate closed or open.

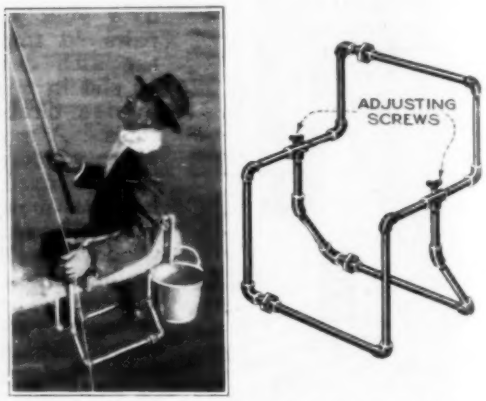
Preserving Toothpaste

Even though the cap is lost from a tube of toothpaste or shaving cream, it is unnecessary that any of the contents be wasted or allowed to dry in the opening. Very soft toothpaste in particular will run out of the tube if the latter is left on its side without the cap in place, resulting in waste and muss. It is only necessary to press on the tube at points opposite those where pressure was first applied to squeeze the paste from the tube. By so doing a vacuum is formed in the tube and the paste is sucked back to a point well beyond the opening. The short neck of the tube is thus emptied, and the possibility of the material hardening is considerably reduced.

Solid Comfort for the Fisherman

Sitting all day on the edge of the pier, or on bridge piling, may not tire the enthusiastic fisherman, but even the most devoted follower of Izaak Walton cannot pretend that he wouldn't like a more comfortable seat than that afforded by the wood or concrete. One Florida angler has solved the problem of comfort in an ingenious way by making a back and foot rest that can be attached to the stringers of the pier or bridge from which he is fishing.

As shown in the illustration, the rest is very simply made from pipe and fittings. The construction is quite evident from the drawing, and nothing further need be said except that the tees used on the horizontal members of the rest should be one size larger than the pipe composing the frame, so that they can be slid back and forth to make the rest fit various sizes of timbers. It would be easy, also, to fit additional cross members at back and front, and to put in a seat of canvas, so that the



The Fisherman's Comfort and Safety Are Both Promoted by This Simple Back and Foot Rest

device could be used as a seat where it cannot be slipped over a balk of timber.—Turner Nearing, St. Petersburg, Fla.

¶Some of the larger iron bedsteads often sag down on the rollers so that it is difficult to move them about. This can be cured by driving a hardwood plug into the bottom of each post and boring a 3/8-in. hole in it, then putting in a regular roller intended for wooden beds.

Foiling Petty Thieves

When attaching a padlock hasp to a garage door recently, I found that the construction of the door made it necessary to fasten the hasp on the outside with wood screws. Obviously such a method of fastening would offer little resistance to petty thieves, who could get in by merely using a screwdriver. To foil such an attempt, I applied hard solder to the screw heads, which were flat, and all over the surface of the hasp. This filled up the slots in the heads of the screws and also attached them to the hasp. Of course, a thief who really wanted to get in, could "jimmy" the hasp or padlock, but it seemed advisable to at least try to discourage the petty thief. —J. E. Hoag, Los Angeles, Calif.

A Light Automobile Trailer

A light-running and sturdy trailer, of the kind shown in the photograph, is of service to contractors and others who need to transport tools and equipment. The chassis consists of an old Ford front axle and spring, and a Ford "wishbone" brace or radius rod, items that can be obtained at any auto-wrecking concern. The wishbone keeps the chassis rigid and prevents it from swaying sideways. The body is easily made; it consists of a floor and four sides screwed together securely and bolted to the spring. A railing, detachable or permanent, for larger tools may be added if desired. The trailer is attached to the rear end of any auto by means of a small

Light and Sturdy Trailer Can Be Built by Anyone from Old Automobile Parts to Carry Tools and Other Equipment

fixture, which is attached to the tongue, as shown in the lower left-hand detail.—C. M. Wagner, Newark, N. J.

Gas Tank for Outboard Motor

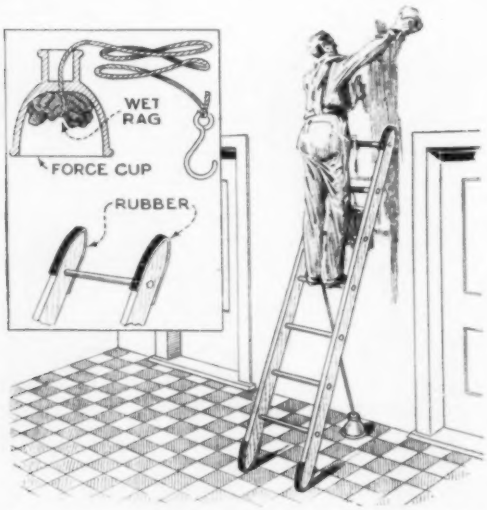
Outboard motors used on rowboats and canoes are usually provided with a 1-gal. fuel tank, but this is not large enough for those who make long cruises, as it must

Auto Gasoline Tank in Boat Holds Large Quantity of Fuel for Small Outboard Motor

be refilled about every two hours when running continually. Furthermore, for use in such motors, the lubricating oil must be thoroughly mixed with the gasoline before filling, and this task becomes a constant annoyance. Refilling the tank so often also adds to fire hazard, especially if the water is rough enough to rock the boat and cause the gasoline to be spilled around. By installing an old automobile gasoline tank and connecting it to the small motor tank with copper tubing, this trouble is avoided. Air pressure is applied by means of an ordinary bicycle pump to force the gasoline up to the motor, a tire valve being soldered to the upper part of the tank to permit this. The copper tubing is connected with suitable fittings and a shut-off valve is inserted in the line so that the motor can be disconnected without losing the air pressure in the tank. With this outfit, a few strokes of the pump now and then will be found all that is necessary to keep the motor tank filled.

Holding Ladders on Tile Floors

Smooth concrete or tile floors, especially if wet, are unsafe supports for ladders, as many workers no doubt have found out.



Danger of Slipping on Tile Floors Is Eliminated by Using a Plumber's Force Cup

To reduce the danger of slipping to a minimum, a plumber's force cup has been found of service. The handle is removed and a length of clothesline is brought through the top of the cup as shown. A stout hook is tied at one end and a wet rag to the other end, inside of the cup, to make it air-tight. The hook is attached to a rung of the ladder and the cup is then pressed tightly against the floor. As an additional precaution, rubber strips may be tacked to the sides of the ladder at top and bottom.—J. E. Noble, Toronto, Can.

Limiting Speed of Autos

Automobiles and motor trucks not infrequently are in charge of irresponsible drivers who attempt to drive at high speed, to the detriment of the car and with constant danger of accident. Some form of governor is therefore desirable, but these are usually complicated and expensive, and it will be found that for ordinary purposes the much simpler device to be described will accomplish the same result.

Between the carburetor and the intake manifold a gasket is usually placed to insure an air-tight joint, and the hole in this gasket, through which the gasoline vapor passes, is, of course, the same size as the carburetor outlet. To prevent the driver from running the engine at excessive speed, it is only necessary to remove this gasket and replace it with another having a smaller hole.

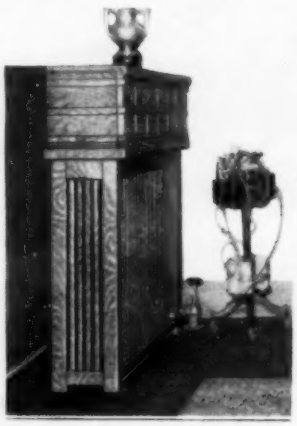
There will be no difference whatever in the operation of the car as far as ordinary speeds are concerned, but when a driver opens the throttle wide to get excessive speed, the attempt will fail because the amount of vapor fed to the engine cannot exceed that which the special gasket will allow to pass. No definite rule can be given as to the size of the aperture, as it will vary for different makes of cars and trucks, and must be determined by trial. About half of the original opening is a good point to start experimenting from. A decided advantage of this kink is that the car shows no outward evidence of a speed-control device.—V. A. Lyman, Casmalia, Calif.

Renewing a Wafer Thermostat

When ready to start my chick brooder, I found that the wafer thermostat was empty and would not work. Having no ether, with which it was originally filled, I made a small hole in each part and poured about two teaspoonfuls of alcohol into each compartment. I then closed the holes with solder and the thermostat now works as well as ever.—William R. Hopkins, Ballston Lake, N. Y.

Hiding the Radiator

The photo shows a neat method of hiding a steam or hot-water radiator. A cabinetmaker was employed to build a slatted hardwood box to fit over the radiator as shown. Although this box has been used for over a year, it has not warped at all. The wood was neatly finished in harmony with other woodwork in the room—in this case an office—and the space above the box was utilized for a filing cabinet. The appearance of the office was much improved.



Toy Bombing Plane and Battleship

By CHAS. D. TENNEY

SEVERAL old battleships, recently discarded by the United States government, have served their last purpose as targets for bombing aeroplanes, and the actual destruction of the ships in this way was quite a spectacular and thrilling event. No doubt many boys who have read about this or seen it in the news reels of the "movies," will be greatly interested in a toy bombing plane and battleship, with which they can re-enact the scene themselves, imagining that they are the pilots of the bombing planes flying above the ships and sending missiles down upon them. At least, an Idaho lad finds considerable diversion and amusement in directing the aeroplane over the miniature battleship, which floats in a large tub of water, and dropping marbles down on it, which, if correctly aimed, hit the ship in the fatal spot and cause it to fly apart as shown.

The plane and ship are both made of wood. A convenient size for the ship is about 3 by 10 by 1½ in. The method of construction is clearly shown in the upper detail. It consists of a body, in which a recess is cut to hold an ordinary spring mousetrap; a deck of ¼-in. material, which is cut to the same pattern and fits over the body, and an upper deck, gun turrets and smokestacks, which are placed on the deck, as indicated by the dotted lines. One of the smokestacks has a long

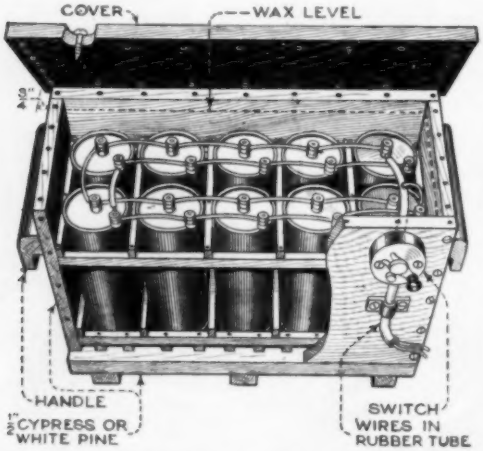
Amusing Toy Bombing Plane Suspended from Tree Hurls Marbles on Miniature Battleship, Floating in Tub of Water. If Aimed Accurately the Marbles Will Cause the Ship to "Blow Up"

nail driven into the end to extend down through the decks to reach the trigger of the mousetrap, on which it rests, holes being, of course, drilled through the decks to permit this. Nails are also driven into the gun turret to resemble guns and a mast. In use, the mousetrap is set, the decks and smokestacks carefully put on the body and the ship then floated in the tub. The moment the rear smokestack is touched it trips the mousetrap and this shatters the ship. A coat of slate-gray is applied to make the ship appear more realistic and to protect it from the water.

The bombing plane is constructed according to the lower detail. It does not have to be light in weight as it is hung on the limb of a tree or other support under which the tub is set. The sides and wings are made of ¼-in. wood or wallboard, nailed to two small blocks of ¾-in. wood at the front and rear. A convenient length for the plane is about 8 in. The wing is tacked to the upper side of the body, and a small screweye is driven in the center of the wing to permit a length of cord to be tied on, which holds the plane suspended from the limb. The propeller, rudder and wheels are cut from tin or light galvanized iron. Two marbles, which are used as bombs, are held in the space between the endpieces, and are dropped one by one by means of a trigger, which is pivoted between the sides as shown. When pulled down with a string, the trigger releases one marble, the other marble being held back. It is, of course, preferable to make a vertical magazine to hold several marbles. A length of metal tubing, about ¾-in. in diameter, attached just above the trigger, can be used for this purpose. A rubber band is fastened to the trigger to draw it up again as soon as the pull is released. In use, the aeroplane is guided by means of a string tied to the underside, as indicated. As the plane is swung over the ship the trigger is pulled down and a marble released. Accurate marksmanship is, of course, necessary in order to hit the rear smokestack, and this takes practice.

Waterproof Battery Box

After being submerged for twelve hours, in a sunken boat, the dry cells stored in the battery box constructed according to the design shown in the illustration were still perfectly dry, proving that this box is really waterproof. It should therefore appeal to all motorboat enthusiasts. It is made of ½-in. cypress or white pine. The parts must be cut accurately and are screwed together securely. Two handles are provided on the sides to facilitate carrying. The inside is partitioned to hold the individual cells tightly, narrow slats being tacked to the bottom of the box to keep the cells clear of it. After the cells have been properly wired, the outgoing wires are pushed through a length of rubber tubing, which fits snugly in a hole drilled through one of the sides. A small single-pole ignition switch is mounted on the outside of the box just over the hole, and one of the wires is cut and the two ends thus formed are connected to it. The two leads coming from the switch on the outside are also protected by rubber tubing as shown. A small metal cleat, screwed to the box over the wires, takes all the strain and prevents the ends connected to the switch from being pulled out. Ordinary wax or paraffin is melted and poured between the cells and on top of them until it covers the wiring. The cover is then screwed on the box securely and this completes the work.—Henry S. Laraby, New Haven, Conn.



A Battery Box That Will Appeal to Motorboat Owners, as It Is Completely Waterproof

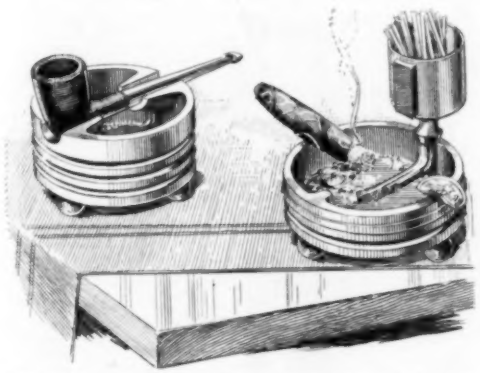
Cleaning Automobile Headlamps

There are many cleaning compounds on the market, but it is a matter of careful selection to find something for cleaning the highly polished silver-plated reflectors of automobile lamps without producing a myriad of small scratches. Each scratch is insignificant in itself, but when the entire

surface of the reflector is covered with them the efficiency of the headlamp is seriously impaired. It has been found that high-grade rouge is an excellent cleaner and polisher for reflectors. It is used with alcohol and there is no danger of scratching. A clean, soft cloth is used and the rubbing should be done from the rim toward the center instead of around the center. Mud splashes on the headlight glass should be soaked off gently with warm water and a soft cloth or soft sponge.

Novel Ash Trays

The novel ash trays shown in the drawing are made from discarded automobile pistons. The feet are steel balls, ½ or ⅝ in. in diameter, soldered to the base. The match holder in the right-hand figure was made from a discarded pressure-pump piston, a piece of an old flat file being sweated on to serve as a match striker. The cigar or cigarette holders are made from metal disks, bent and soldered to the edge of the tray. After the trays have been completed, they may be plated with copper or brass, or oxidized. Nickelplated piston rings snapped around them to fit in the grooves add considerably to the appearance, or the grooves may be painted with a bright color.—C. W. Rose, Astoria, N. Y.



Attractive Ash Trays Made from Discarded Automobile Pistons

Handy Pantry Step

Many housewives find it rather difficult to reach the top shelf of the pantry without using an old chair or box, and this usually has to be carried in from the kitchen. It is much better to keep a small box handy, with a handle provided on it as shown in the drawing. Any sturdy wooden box, obtainable at a grocery store, will serve for this purpose. A hole is drilled in one side near the bottom to receive a length of broom handle or a similar stick, about 3 ft. long, which is nailed or screwed to the bottom. The method of using the step is obvious from the drawing.—Mrs. Laura B. Kurtz, Chicago, Ill.

Handy Pantry Step for the Busy Housewife Makes Reaching the High Shelves Easy

A Hayloader Timesaver

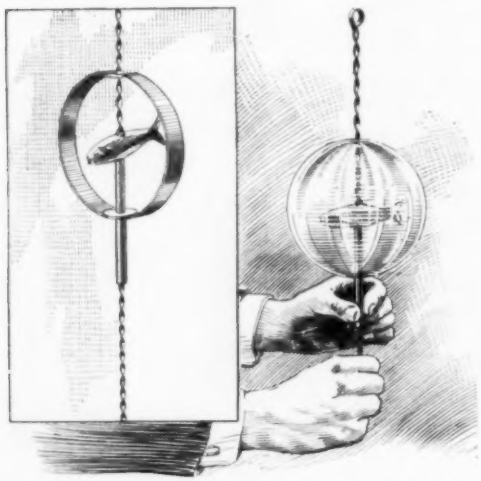
A southern Wisconsin dairy farmer uses a simple time and labor-saving device with the hayfork at the barn when unloading. Instead of using the ordinary doubletrees, dragging them over the ground back to the barn and lifting them around for every trip with the elevating rope, he uses an ordinary harrow cart, with a grabhook chained around the axle under the seat; this hooks over a short chain attached to the end of the hayfork rope.

The farmer's small boy drives the team out and back, unhooking and hooking the chain as well as a man can do it. Besides saving labor, it is less annoying for the team, as it avoids stepping over traces, stripping tugs, and all other annoyances.

The harrow cart is homemade also, just two old corn-planter wheels with a gas-pipe axle and a pole from the woods, ironed and bolted together by the local blacksmith at a total cost of less than $2, aside from the material picked up on the junk pile.—J. H. Deniston, Bayfield, Wis.

Simple Toy That Provides Optical Illusion

The little toy shown in the drawing produces a convincing optical illusion. It consists of a spiral rod, twisted from thin



This Simple Toy Produces the Illusion of a Fish Swimming in a Globe of Water

brass strip, about 3/16 in. wide and 1 ft. 4 in. long; on this rod is fitted a flat-brass ring, about 4 in. in diameter, with slots cut in it at top and bottom to fit the brass strip, so that the ring will revolve when it is pushed along the spiral. A tin fish, with a hole drilled through its body to clear the spiral, is held at the center of the ring by means of a sleeve made of brass tubing, the bottom of the sleeve resting on a thin washer, which in turn rests on the ring. Another sleeve of the same material, slipped over the spiral below the ring, completes the toy.

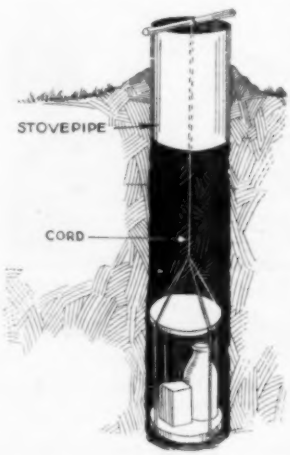
By means of the lower sleeve the ring and fish are pushed up to the top of the rod. When the top has been reached, the lower sleeve is released, and the ring and fish drop down, the former spinning rapidly, while the fish remains still. The effect seen is that of a fish in a globe of water. The faster the ring is pushed up or down, the better the illusion.

Repairing Worn Babbitt Bearings

Some well-known automobiles use very costly bronze-backed babbitt-lined bearings to carry the crankshaft and the connecting rods. Frequently, it is impossible to adjust these bearings, making it necessary to replace them when worn. However, they can often be repaired in the following way: Clean all grease and oil from the bearings thoroughly, which can be done with a solution of washing soda and hot water. Set the halves of the bearing in such a position that melted babbitt can be poured on the old babbitt surface, which is done until the old surface is completely covered. A soldering iron, already heated to a temperature just above red heat, is then applied to the babbitt to puddle the fresh babbitt into the old, care being taken not to run the babbitt out of the bronze. It is best to puddle it in a small spot at a time so that the babbitt can be controlled. As soon as this has been done and the babbitt allowed time to cool, the surface of the bearing can be scraped down to a proper fit, and the bearing should give just as good service as a new one. A repair of this kind can also be made on a bearing that has been badly scored. It is of great importance to use good babbitt and to make sure that the new and old babbitt are well fused together.—C. F. Worfolk, Royal Oak, Mich.

Iceless Camp Refrigerator

While on a camping trip one member of the party carried a short length of stovepipe, two wooden disks of slightly smaller diameter than the pipe, and a length of stout twine, with which he made an iceless camp refrigerator for preserving milk and butter. He borrowed a post-hole auger from a neighboring farmer, to drill a hole in the ground. The hole was about four feet deep, and the length of stovepipe was pushed down into it to prevent the earth at the top from caving in. The pipe was allowed to project above the surface of the ground, and loose soil was banked around it, as indicated. The wooden disks and twine were arranged to form a miniature elevator. The food articles were wrapped up in a paper and put on the lower disk, and the device then lowered into the hole until it nearly reached the bottom. A stick was



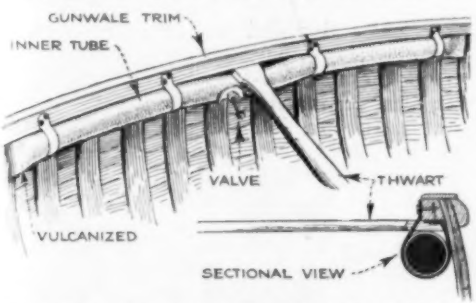
tied to the upper end of the twine and laid across the top of the stovepipe to hold the food suspended in a hole and prevent the end of the twine from being dropped down into the hole accidentally. A piece of canvas thrown over the top of the pipe proved effective in keeping out bugs, and the food was kept in palatable condition.

Hand Pump Made from Auto Oil Pump

When draining a number of lavatories in a summer hotel a hand-suction pump, made from an auto oil pump by simply reversing the washer on the oil pump and attaching a length of rubber tubing to the nozzle, was found of considerable assistance. The hose was inserted into the traps of the lavatories and only a few strokes of the pump were necessary to start a siphon action, which soon emptied the traps. A pump of this kind can also be used for numerous other purposes.—H. Klein, Parkersville, N. Y.

Increasing Buoyancy of a Canoe

An ordinary canoe will, when capsized, sink if the occupants attempt to keep themselves afloat by holding on to it. To make it buoyant even when filled with water is a simple and inexpensive job. Two automobile inner tubes are cut in two and the ends vulcanized shut so that the tubes will hold air without leaking. After inflation to about 4 in. in diameter, the tubes are wrapped with tape for their entire length to confine any weak part that may have bulged out. One tube is then tied under the gunwale on either side of the canoe, in the center, with strips of leather tacked to the gunwale, as shown.



Inner Tubes Fastened to Gunwale Trim Keep Capsized Canoe Afloat

An excellent substitute for a rubber mallet is a rubber crutch tip slipped over the head of an ordinary hammer.

Convenient Shingle Holder

A simple and convenient shingle holder can be knocked together in a few moments from a few boards and a wedge-shaped piece of wood. The construction is clearly shown in the detail. Such a holder is especially convenient when shingling walls, but can also be used on the roof. It is large enough to hold several bundles of shingles. In use, it is attached to the wall or roof by means of 20-penny finishing nails.—L. A. Bull, Seattle, Wash.

Shingle Holder, Which Is Nailed to Wall or Roof.

Ferrotyping Prints

Prints can be prevented from sticking to ferrotype plates by carefully observing the following instructions: Clean the plate carefully with soap and warm water; rinse and put away to dry. Then sprinkle a few drops of kerosene on the plate and rub the surface until the "bloom" disappears. This is best done with a flannel ball, made by wrapping a square piece of clean flannel around a core of cotton wadding, and tying the flannel corners with a cord.

To prevent air bubbles between the print and ferrotype plate, the latter should be immersed in water and the print applied under the water. Plate and print are then taken out and pressed together. For best results, cooled boiled water should be used, as most of the air in the water is removed by boiling. If the plate is very large, the surface may be flooded with water to avoid the use of large trays.

Moving Heavy Furniture up Stairways

Pianos and other heavy objects can be moved up steep inclines, such as stairways, very easily by means of the simple winch shown in the illustration. It consists of three lengths of 1¼-in. gaspipe, two floor flanges and two elbows, which are screwed together to form a shaft and crank. Two lengths of stout rope, one having a heavy iron ring at each end, are also provided. The rope equipped with rings is brought around the piano as shown, the rings being slipped over the shaft. Heavy pads are, of course, provided around the corners to protect the varnished surface. A ¼-in. hole is drilled through the center of the shaft to receive an eyebolt, and one end of the second rope is tied to it, the other end being securely tied to some support at the top of the incline. In use, the operator moves the piano up the stairway by turning the crank. A floor flange is screwed on each end of the shaft, as shown, to prevent the rope from slipping off as it is wound on. A short length of rope near the crank holds it securely and prevents the winch from unwinding when the operator does not wish to turn it.—G. E. Hendrickson, Argyle, Wis.

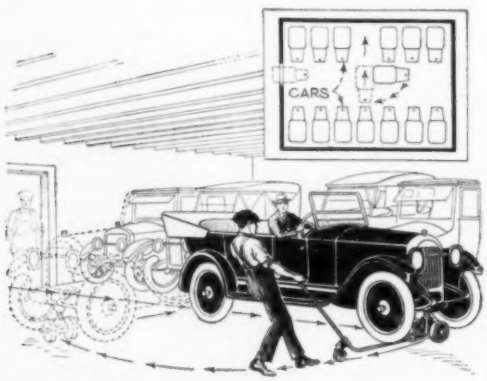
Simple Winch for Moving Pianos and Other Heavy Furniture up Steep Stairways

Battery Corrosion as Soldering Flux

When soldering iron with ordinary solder it is customary to coat the iron with copper-sulphate solution to make the solder adhere. Another substance that serves the purpose just as well is the bluish-green corrosion found on the positive terminal of storage batteries, which also contains copper and is easy to scrape off. It is rubbed on the iron after the latter has been cleaned and made bright, and the solder is then applied. This kink may be found handy when copper sulphate is not available.—V. A. Lyman, Casmalia, Calif.

Increasing Garage Storage Space

Garage men who find their car space limited may profit by following the example of one resourceful proprietor who practically doubled his storage capacity without the expenditure of a cent. He saved the usual 2-ft. space on each side of a car, ordinarily allowed for maneuvering it, in the following way: When a motorist drove his car up the center aisle he was stopped just past the car next to which he was to park. The front end of the car was then lifted upon a wheel jack and swung around until it was at right angles to the aisle, as shown by the dotted lines in the drawing. It was then backed into the parking space with only about ½ in. of clearance from the adjacent cars. The only requirement is that the aisle must be somewhat wider than the length of the biggest car one expects to shelter. Skillful manipulation of the wheel jack is soon learned by any garage attendant.—Myron Drachman, New York, N. Y.



Utilizing all the Space in a Large Garage by Simple Method of Parking the Cars

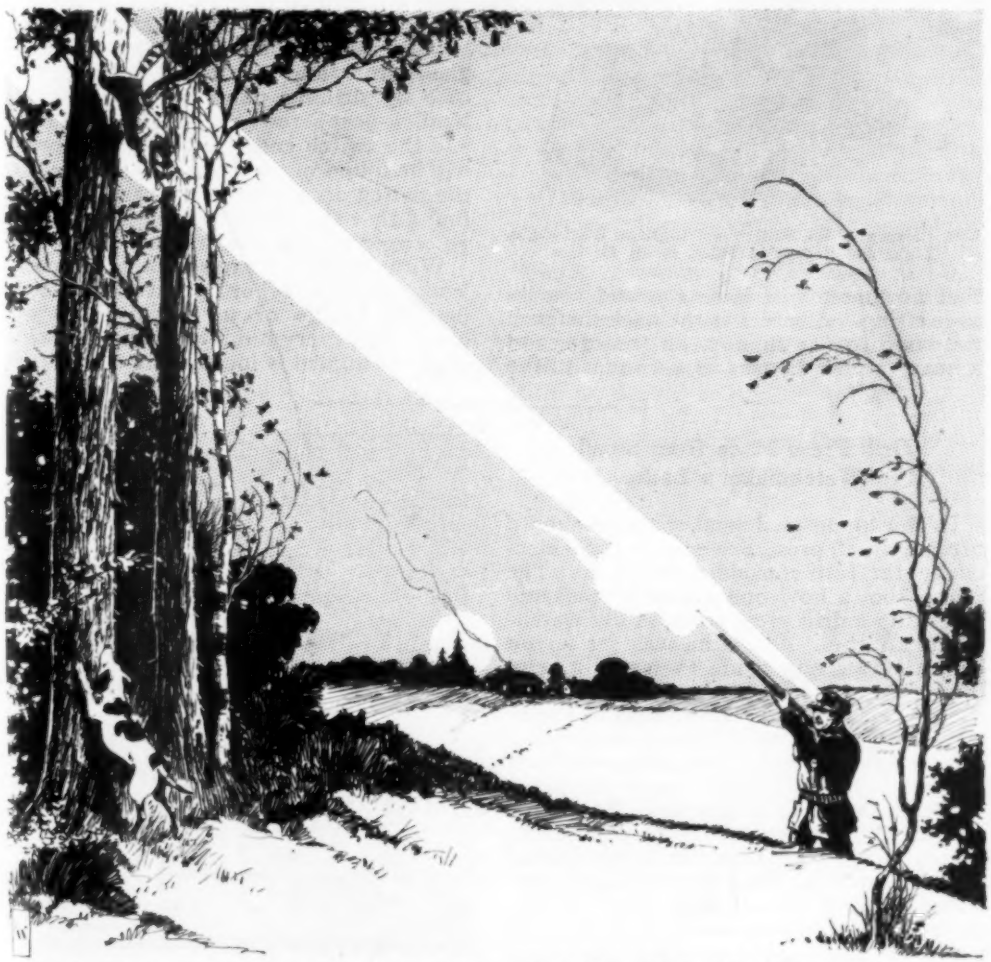
¶Celluloid can be cemented to glass by means of a solution of equal parts, by weight, of gelatin and acetic acid.

Electric Spotlight for Night Hunting

By AVERY E. GRANVILLE

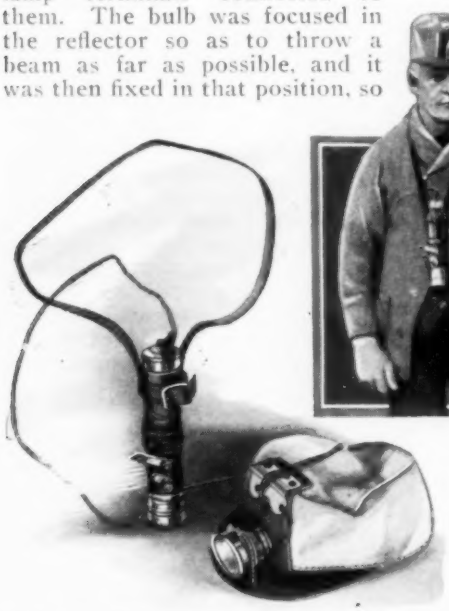
FOR night hunting, such as trailing raccoons, opossums, skunks and the like with dogs, one needs a light that will leave the hands free as well as throw a powerful beam. A cap light of some kind is the most logical one to use, for a light over the hunter's eyes that throws a beam straight ahead enables him to see an animal's eyes much better than one held anywhere else, the reflection coming direct from the animal's eyes to the hunter's. Such a light will often enable him to see his game up a tree or amid dense foliage when it could not be detected otherwise. The right kind of a cap light is also excellent to shoot by, and one can hit almost as well as by daylight—sometimes better.

Many hunters use carbide lights of the miner's type, but these, while much better than oil lamps of any kind, diffuse the light too much for best results. Some carbide lamps are equipped with bull's-eye lenses, but even then they do not approach the efficiency of a first-class electric spotlight. To have a lamp that would throw a spotlight beam a long distance, and at the same time be convenient to carry and handle, I made the outfit shown in the illustrations. I used parts from two spotlights, one new and the other a broken one. The cap was a common miner's cap with fiber and metal plates in front to hold the light in place. The part attached to the cap was the lamp end of



Hunting 'Coons and 'Possums at Night Is Made Comparatively Easy with the Aid of This Electric Spotlight, Mounted on the Cap

the new spotlight, the screw cap from the old one being fitted to it at the back. Brass binding posts were soldered in place for the connecting wires, and the lamp terminals connected to them. The bulb was focused in the reflector so as to throw a beam as far as possible, and it was then fixed in that position, so that no amount of jarring would change the setting. A screw at the back fastened the lamp to the support on the cap, and a heavy cord was used to anchor it to the visor, to prevent it from tilting upward when in use. To get the light in the proper position, I shift the cap.



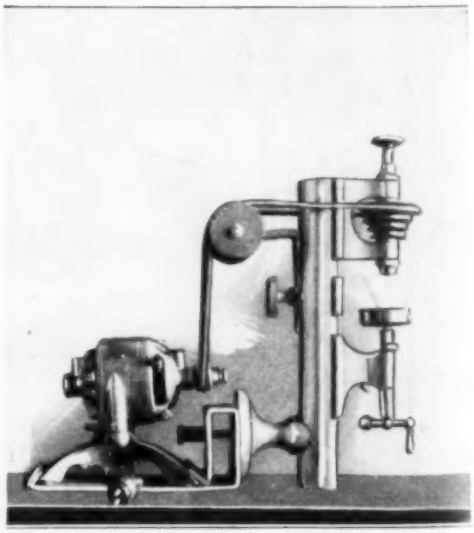
Left, Closeups of the Battery and Light on Cap; Right, Light and Battery in Place, Ready for Use

A double wire runs from the binding posts on the lamp to the battery, which is suspended by a strap around the neck. The strap is just long enough to bring the battery well down on the chest, where the switch can be operated easily. The battery is the regular three-cell type, the case being that of the new spotlight with the lamp end replaced by a plain screw cap, into which a binding post has been soldered. The lower binding post of the switch is connected to the lower screw cap by a short piece of insulated wire, securely soldered in place. Thus, when the switch is closed, the current has a free passage, and lights the lamp on the cap. The switch used is a cheap knife switch which can be bought at any electrical-goods store, and is fastened to the battery case by drilling holes and running the binding-post screws through both the case and the switch ends. This type of switch will be found much more satisfactory than the switch originally on the case, as I have found that the sliding switch is too apt to go wrong at a critical time.

With this light I can spot a 'possum or a 'coon 200 ft. away, or up a tree amidst the densest foliage or tangle of limbs and brush, and every hunter knows that when once the animal is located the rest is easy.

Drill Press Made from Small Watchmaker's Lathe

In the home modelmaker's workshop a precision drill press, driven by a small electric motor, is of considerable service. The photo shows how one amateur mechanic rigged up a drill press from an old watchmaker's lathe. The lathe was set up on end, and a clamp made to fasten a sewing-machine motor to the pedestal, using the regular pedestal clamp screw to fasten it. Another flat-steel clamp or bracket was fitted with two guide pulleys and attached to the lathe bed under the headstock, the toolrest clamp screw holding it in place. The motor is controlled by means of a foot rheostat in the usual manner, and the feed for drilling is obtained through the tailstock.



Discarded Watchmaker's Lathe and Sewing-Machine Motor Make Precision Drill Press

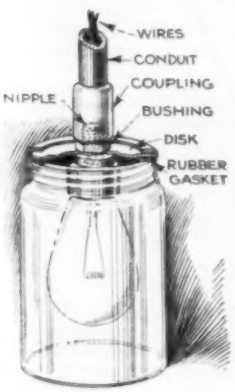
¶ Boil clothespins in salt water to prevent splitting.

New Use for Corn Cobs

Regardless of the customary banter on the farmers' numerous uses of the humble corn cob, I ran into another use for it and found it really worth while. After using a shovel, in damp clay and muck, much of which stuck to the blade, making it difficult to work with, I looked around for a small stick to scrape the shovel clean but happened to spy a corn cob. This I picked up as a substitute, tried it and got a pleasant surprise. It served the purpose much better than a stick; it was handy and scoured the shovel besides cleaning off the dirt. Since then I have tried cobs for cleaning everything used in ground work and found them very satisfactory. Cobs cost the farmer practically nothing and there are always plenty of them around.—J. R. Koontz, Bremen, Ind.

Water-Tight Fixture Protects Light

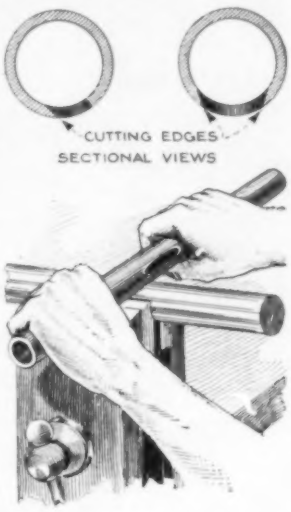
Sometimes it is necessary to protect an electric lamp against moisture. This can be done by providing the water-tight fixture shown in the illustration. It is made from a ½-pt. fruit jar with a screw cap; a 1/16-in. sheet-metal disk is soldered to the inside of the cap as shown, and a hole is drilled through the center and tapped for a short nipple. A bushing and coupling are screwed on the nipple, and the fixture can then be screwed to a length of conduit, through which the electric wires are run, the joints on the conduit being made up with white or red lead, as in water or steam piping. The customary rubber ring serves as a gasket.—L. H. Georger, Buffalo, N. Y.



Distilled water can easily be poured into a storage battery from a milk bottle fitted with a good cork. Two notches are cut opposite each other in the side of the cork. The finger is pressed over the upper hole and the lower one is placed over the battery-cap hole. Upon releasing the finger, the water will flow. It is stopped by closing the upper hole.

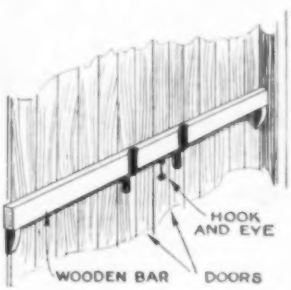
Spokeshave Made of Steel Pipe

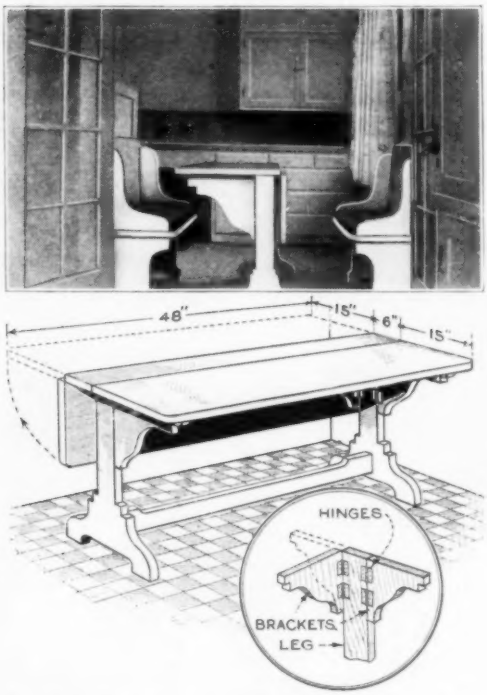
The spokeshave is a very handy tool for rounding wooden plugs, dowel pins, handles, etc., but while it is used frequently when available, the average home worker hardly feels justified in purchasing one. A good spokeshave can readily be made from steel pipe, however, as indicated in the drawing, which shows a tool made by a Virginia man. An 18-in. length of steel pipe, about ¼ in. in diameter, is drilled and slotted; then the lips of the slots are filed to form cutting edges and sharpened with a small oilstone. Two slots may be cut in the pipe and filed to form two different kinds of cutting edges, as shown in the sectional views. The handles and edges are combined in this simple, inexpensive tool. Wrought-iron pipe should not be used, as it will not hold an edge.—G. A. Luers, Washington, D. C.



Locking Barn Doors

Double doors on farm buildings are commonly fastened by means of a wooden bar resting on iron latches, as shown in the illustration. This method is not always reliable as the doors are often loose enough to allow the bar to be raised from the outside by means of a thin tool. In order to prevent this, it is a good idea to provide a stout hook on one of the doors and a screweye on the underside of the bar. This arrangement holds the bar down securely.—E. T. Gunderson, Humboldt, Ia.





Breakfast Nook Comprising Two Benches and a Table Adds Coziness and Convenience to Apartment

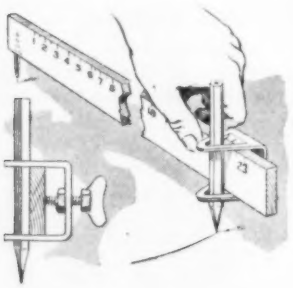
A Spacious Breakfast Nook

One apartment-house dweller replaced the single door between the kitchen and dining room with double French doors. On the kitchen side he provided a cozy breakfast nook as shown in the photo. It consisted of two benches and a table with a collapsible top, which afforded free passageway between the two rooms. One bench was built against the wall and a paneled partition, 4½ ft. high, was erected behind the other, to hide the gas range and other kitchen equipment. The dimensions of the table and its construction are given in the illustration. It has two leaves, 15 in. wide, hinged to a center piece so that they can be folded down, and in their open position supported by brackets hinged to the legs, as indicated. Comfortable cushions, made from four thicknesses of old comforters, covered with navy-blue burlap, are provided on the benches.—A. May Holaday, San Jose, Calif.

¶Places that are hard to reach with the oilcan may be lubricated by running a wire to the spot where the oil is needed and allowing the oil to flow down the wire; it will follow the wire if the latter does not touch any other part of the machine.

Easily Constructed Beam Compass

Finding it necessary to scribe some large arcs but not having a beam compass, I devised one that proved entirely satisfactory and I have been using it ever since, even when regular beam compasses were at hand. The needle point of an old compass was pushed into the edge of a yardstick, right under the zero point. The movable pencil holder was made of No. 11 gauge sheet steel, cut and bent to the shape indicated so that it could be pushed along the yardstick. The holes in the ears were given a triangular shape so that they would firmly hold a pencil or pen. A hole is drilled through the back part and an ordinary ¼-in. hexagon nut is soldered on the inside to provide threads for a thumbscrew, which is used to tighten the fixture on the rule. The base of the upper triangular hole in the slide is beveled and a mark made in the center of the beveled edge to facilitate correct setting; it is an advantage always to use the same pencil. —J. H. Kay, Cleveland, Ohio.



Making Adhesive Tape Stick

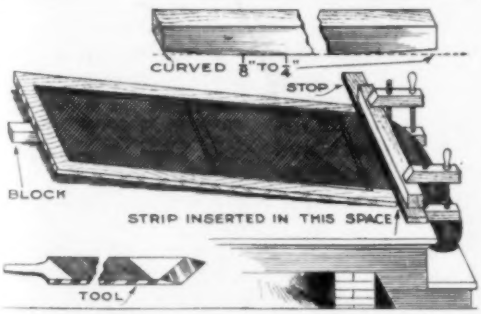
It frequently happens in the workshop that one gets his hand cut in a place where adhesive tape can hardly be made to stick, as for instance, over a joint, where movement of the finger soon causes the tape to work loose. By making a few slits in each end of the tape and spreading the ends out as shown, the tape will usually adhere anywhere, even on a joint. If wide tape is used, slits can also be made in the sides.—Jonas Byberg, Silverton, Ore.

¶Use passe-partout binding to paste canceled checks to the check-book stubs.

Covering Frames with Screen Wire

When stretching screen wire, canvas or muslin over frames or panels, the method illustrated will produce a tension as uniform at the center as at the edges.

Two wooden strips are required; one of them is fastened to the porch floor or bench where the work is being done, to serve as a stop and the other is used to clamp the wire cloth. The latter strip is curved as shown in the drawing, so as to grip the screen tightly in the center. Fasten the screen wire to one end of the frame and butt the opposite end against the stop. Place a block of wood underneath the outer end of the screen, then draw the wire up taut and clamp it between the strips as shown. Remove the block from underneath the end of the frame, allowing the end to drop, thus pulling the wire taut; if the wire is not pulled up tightly enough, raise the frame and insert a narrow strip of wood between it and the stop. Place a weight on the outer end of the screen, to hold it down, and tack on the wire and molding, if any is used. The wire is cut with a tool made from an old file, similar to the one shown; this not only cuts the wire, but imbeds the ends in the wood, where they are prevented from catching and tearing the hands or clothing.—Arthur W. Carpenter, Wilmington, Del.



Covering Screen Frames with New Wire Cloth Is Greatly Simplified by the Method Illustrated

Handy Block Makes Can Opening Easy

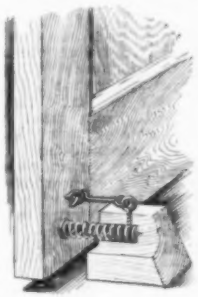
Many women find it hard to hold cans firmly when opening them, and will therefore appreciate the simple device shown in the drawing.

A block of 1-in. wood is cut with a V-shaped opening, as shown, and the faces of the vee covered with strips of fine emery cloth, glued to the wood; the block is then screwed to the work top of the kitchen cabinet. The can to be opened is pushed into the V-notch, where a very light pressure holds its securely. With the can held firmly in this manner, opening it is a very simple operation, requiring no heavy exertion. The angle of the notch and the size of the block should be such that it will hold any size of can that is ordinarily used in the kitchen.—J. E. Hoag, Los Angeles, Calif.

Opening Cans Is Made Easy for the Housewife by the Use of This Simple Holder

Anti-Rattling Doorstop

By providing the simple stop shown in the illustration the usual rattling of a door held simply with a hook can be eliminated. The stop consists of a wooden block a few inches square, and a heavy coil spring held in a hole drilled in the block, as indicated. The block is securely fastened to the floor near the wall, where the door will strike the spring when opened, and the door is held by an ordinary hook. On account of the tension of the spring, no rattling can occur nor can the hook become unfastened. A piece of rubber may be tacked to the door to prevent marring by the end of the spring. —S. H. Candy, Montreal, Can.



¶ When the metal tip of a shoestring pulls off, roll the tip in a little glue or shellac

From the Bureau's Mail Bag

It is with genuine pride that I advise you that my only grandson looks forward monthly to the receipt of Popular Mechanics with as much zest as I did in the old days to the penny dreadfuls. A healthy sign of the times. Ernest is 15 years old. The P. M. M. is great.—Jas. Johnston, Capetown, South Africa.

* * *

In regard to your magazine, I have been a regular subscriber since I first saw it on a railway bookstall. I find it very interesting, as there is not to my knowledge any English magazine which provides such information to those interested in mechanics.—Wm. Harland, Whickham, England.

* * *

In the December issue of your interesting magazine, of which I am still a reader, is an article on a new type of electric hammer drill. Being a mining engineer by profession, this is, of course, of great interest to me, and I would be much obliged if you would pass my name on to the makers of this particular drill, so that they can forward me their literature without further delay.—D. W. F. Hatelie, Ipoh, Federated Malay States.

* * *

Having read your November, 1922, issue, I found a moving picture projector for schools and homes which generates its own electricity. I am interested to purchase one for use of the students of the Kalibo Institute for educational purposes, and it would be a great favor you could do to the school if you could furnish information as to the price and the place where we could purchase such a projector.

We do not have electric current in this town of Kalibo and this is the reason why it has been impossible for the school to secure one of the small projectors for school use.

Hoping to receive your attention and thanking you very much for this favor, and assuring you that the Kalibo Institute students are enjoying very much to read the Popular Mechanics, which was the pioneer in the school, I am, Vicente Salas Reyes, Treasurer, Kalibo Institute, Inc., Kalibo, Capiz, P. I.

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A short time ago, we wrote you regarding the address of manufacturers of articles, descriptions of which appeared in the columns of your magazine, and now wish to thank you for your attention, as we have heard from these firms, and have already secured a sample of their products, and hope to establish a connection with them.

For your information, wish to advise that we are dealing in novelties and household utilities only, and are always on the lookout for something new and useful, as there is a ready market in these countries for such articles; hence, your magazine is always welcome, and we find many things of interest in its columns. —Des Jardines & Company, Puerto Cortes, Honduras.

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I may state that I am running a successful business with an article I am importing from Chicago, Illinois, through seeing an advertisement in the Popular Mechanics.—L. Kaufman, Liverpool, England.

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As I follow with great interest the news from your country and especially what regards the machinery for agricultural purpose, I would trouble you for the names and addresses of the builders of the machines described in your review, motorized cultivator, and wagon that fills and dumps itself in short time.—Mario Mandell, Rome, Italy.

* * *

We have pleasure to say that the magazine published by your office is a great help and guidance to our business, and we prize them very much. By this opportunity, we beg to say that we are engaged in the importation of bicycles and the like for years, and are in good connection with principal dealers of same throughout the country, and if the prices are right, we can assure the maker that large orders will be placed on him from time to time.—Taihei Yoko, Ltd., Osaka, Japan.

* * *

In your March issue, is illustrated a light railroad cycle, of a type which would seem most appropriate for use of track inspectors, etc., on our logging railroads, which are three feet gauge, measured inside to inside of rails.

Would you kindly ask the makers of these machines to send us price list and full description of these machines, and to state whether these could be equipped with a gasoline engine, as some of our grades are quite heavy ones, Shay locomotives being used on this account.—W. G. Phillips, Superintendent, The Suchi Lumber Company, El Oro, Mexico.

* * *

In your September, 1922, issue, you mention a paste that will seal a union, and page 381 of your same issue, you mention a paper on which a Japanese inventor holds a patent. I am interested and shall be glad to negotiate with the patentees. Probably they have some literature, and will let me have a copy, also a specimen or two of the articles themselves.

I have a good knowledge of the patent laws, and I was the first to obtain a patent for a client of mine under the New Zealand patent laws. I am a solicitor of the supreme court here.—Jas. B. Graham, Auckland, N. Z.

* * *

Having arrived here from England a little over a year ago, I have been a regular reader of your magazine for the past ten months, and I can assure you I thoroughly enjoy its contents, which are most edifying.—L. Denbow, East Lyme, Somerset, Bermuda.

* * *

I was highly interested by the details and illustrations of two new small inventions which I found in your magazine for January, 1924. In order to save time, I would be sincerely obliged to you if you would kindly put me in direct touch with the manufacturers of the comb made of paper and the fountain pen with transparent stem, so that I could, without delay, get acquainted with them and introduce these articles into Europe or at least Switzerland.—Mrs. J. Fleur de Lys, Geneva, Switzerland.

* * *

In your issue of December I was interested in the enclosed list of inventions, and would be glad if you would pass on an inquiry to the respective proprietors. If not an imposition on your generosity for the request, I would be pleased to have fuller information regarding each of these lines with a view of securing business on the New Zealand market with them.—Arthur L. Goldfinch, Wellington, N. Z.

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I certainly appreciate your courtesy and thank you for the trouble you have taken to get me in touch with the maker of the small radio set. I am sure that I understand how you put the "popular" in your magazine.—Theodore Irwin, Anchorage, Ky.

* * *

We must thank you very much that you have informed two firms kindly very soon. And we mailed the two firms. We will advertise your publishing magazine for your kindness and we will order your books in your catalog in future.—K. Hashiba & Co., Tokyo, Japan.

Our Bureau of Information exists for your service. Whenever you want information on any article published in the magazine, write to the Bureau and an answer will be given. It is the editorial policy of this magazine never to accept compensation in any shape or form for what appears in our reading pages, and in order to avoid even the appearance of doing so, we are obliged to omit the name of the maker or seller of any article described. This information is kept on file, however, and will be furnished, free, by addressing the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario St., Chicago, Illinois.